WHOI-94-07
IfM-Kiel 243

WOODS HOLE OCEANOGRAPHIC INSTITUTION
Technical Report

BERICHTE aus dem INSTITUT FÜR MEERSKUNDE an der CHRISTIAN-ALBRECHTS-UNIVERSITÄT – KIEL

A moored array along the southern boundary of the Brazil Basin for the Deep Basin Experiment – Report on a joint experiment 1991-1992.

by

Susan Tarbell[1], Ralf Meyer[2],
Nelson Hogg[1], and Walter Zenk[2]

May 1994

Funding was provided by the Deutsche Forschungsgemeinschaft (Si 111/38-1, Si 111/39-1) the Bundesministerium für Forschung und Technologie (03F0535A, 03F0050D) and the National Science Foundation under Grant OCE-9004396.

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1. Introduction

The Deep Basin Experiment (DBE) is an international effort with the principal objective of improving our knowledge of the subthermocline circulation, both in a descriptive and dynamical sense. The DBE is designated as an official World Ocean Circulation Experiment (WOCE) program under Core Project 3. Its plan and implementation are described in the document "Toward a Deep Basin Experiment" (WOCE, 1990). For both logistic and scientific reasons the DBE field work is focussed on the Brazil Basin, a region to the west of the Mid-Atlantic Ridge stretching from the Ceara Rise near the equator in the north to the Santos Plateau–Rio Grande Rise system near 30°S. This report is concerned with the joint German/American [Institut für Meereskunde of the University of Kiel (IfM-Kiel) and the Woods Hole Oceanographic Institution (WHOI)] moored array situated along the southern boundary of the Brazil Basin (Figure 1a and b). It was installed in early 1991 to measure the inflow and outflow along the southern boundary of the Brazil Basin. Complimentary arrays have been set in the Hunter Channel (see below), out from the western boundary near 19°S, across a sill at the equator near 45°W and in the Romanche and Chain fracture zones (Mercier *et al.* 1994 and Speer *et al.*, submitted 1994.)

This technical report describes the data from the German/American current meter array that spanned the western Rio Grande Ridge between the continental slope and the eastern flanks of the Vema Channel (Figure 1a and b), which plays an important role in controlling the abyssal circulation of the western South Atlantic. Further current and CTD data from the Vema Channel may be found in the report by Levy (1983).

Some of the instruments that were recovered from the first DBE array were refurbished and reset in the Hunter Channel, a suspected conduit for further exchange between

(a)

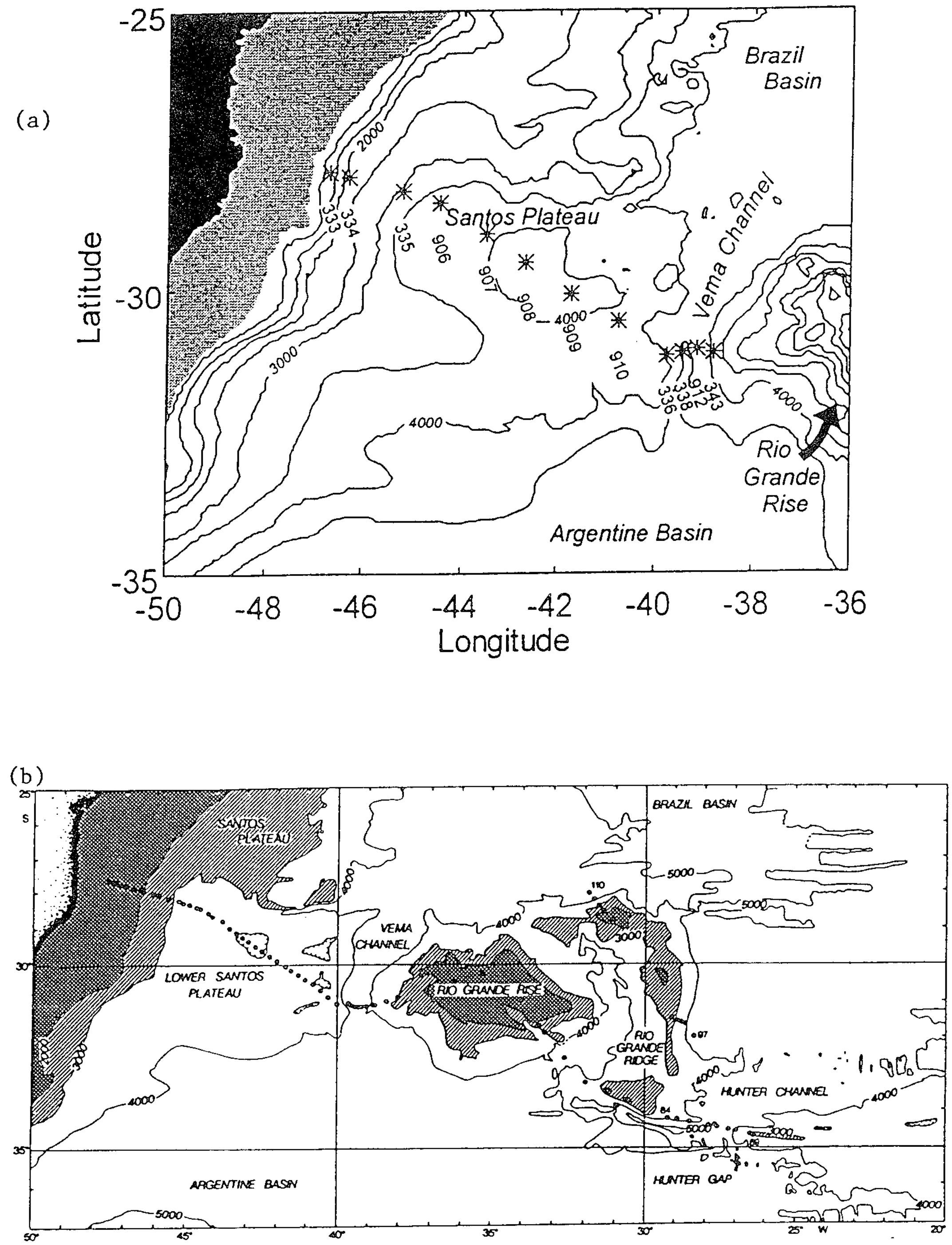

Figure 1: (a) Mooring array on the Rio Grande Ridge. Instruments were deployed during *Meteor* Cruise 15, January 1991, and recovered during Cruise 22, December 1992. One of the 13 moorings was lost completely (VM/337). The uppermost of two instruments was recovered from DB5/910 in October 1994 from the RV *Ewing*, by dragging for the mooring. (b) Bottom topography of the Rio Grande Rise according to Cherkis *et al.* (1989). The Rio Grande Rise separates the Argentine Basin to the south from the Brazil Basin. *Meteor* Cruise 15 included a CTD section (stations 1–89) between the shelf off Brazil and the Hunter Channel. Additional short sections were taken from the eastern (stations 97–101) and northern (stations 107–110) sides of the Rio Grande Ridge. (Speer and Zenk, 1993, with permission of the American Meteorological Society.)

the Argentine Basin and the Brazil Basin. A later report will summarize these data after recoverey in May 1994.

2. Hydrographic Background

Before we consider current meter locations and depths, we will briefly review the hydrographic setting of our array between the Brazilian Slope and the Rio Grande Rise (Figure 2).

Thermocline waters in the west are characterized by the warm, southward flowing Brazil Current and the near-surface Salinity Maximum Water in the subtropics. The subtropical inner circulation is confined to the east by the Brazil Current Front about halfway between the shelf and the Rio Grande Rise. The depth interval of 800–1100m, *i.e.* the region beneath the South Atlantic Central Water (SACW), is occupied by the Antarctic Intermediate Water (AAIW) with its local minimum in the salinity *versus* depth profile ($S \leq 34.4$PSU) and maximum in oxygen ($O_2 \geq 5.2$ml/l). A second, deeper oxygen maximum is characteristic of the North Atlantic Deep Water (NADW) carrying salinities $S \geq 34.8$ at depths between 1800–3200m. Admixtures of lower Circumpolar and Weddell Sea Deep Waters represent the Antarctic Bottom Water (AABW) of the region typically situated below 3200m with potential temperatures lower than 2°C.

3. Array Rationale

Instrument distribution across the Rio Grande section was chosen to be in accord with the first three objectives of the DBE:

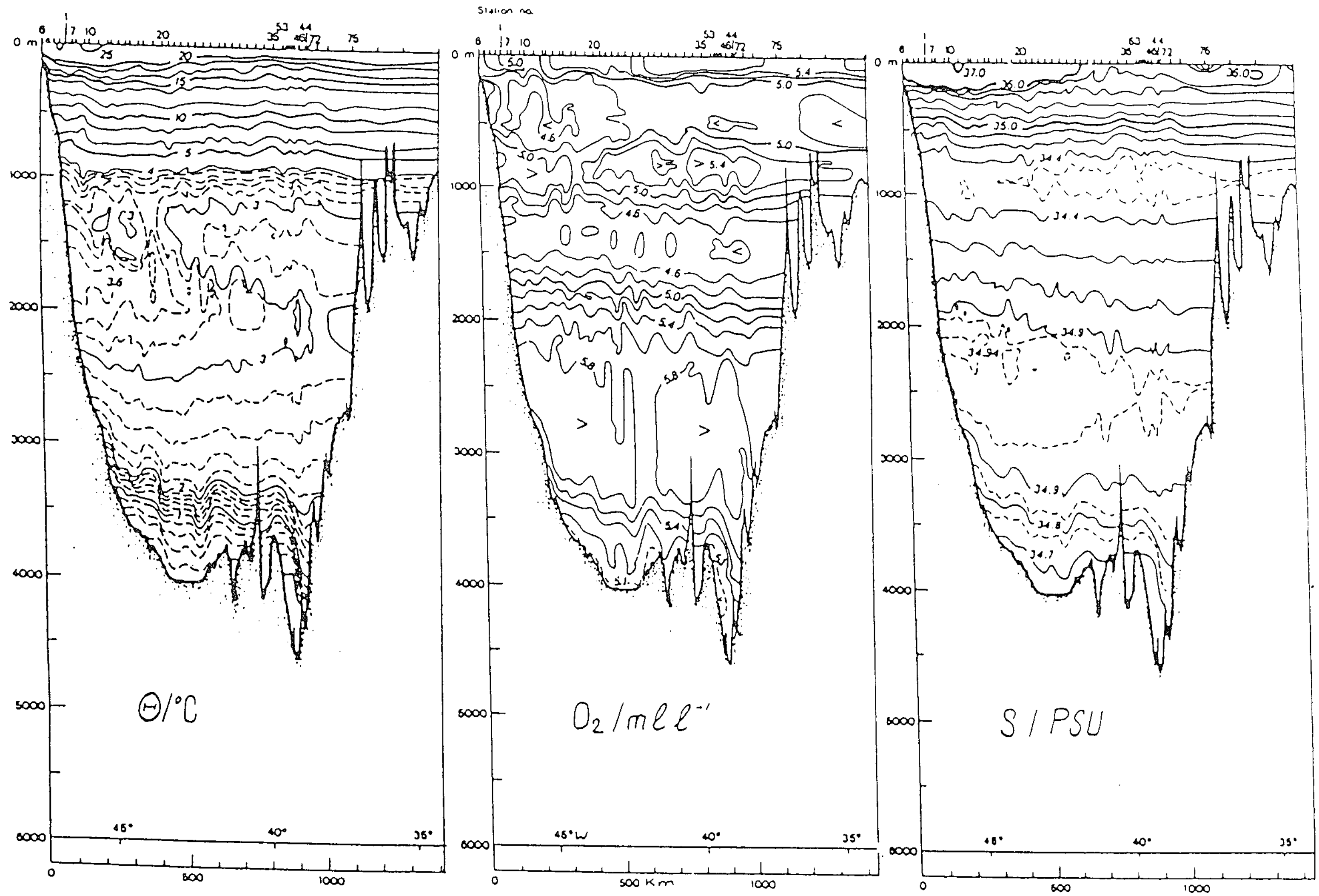

Figure 2: Vertical distributions of potential temperature (°C), oxygen (ml l^{-1}), and salinity (PSU) at a nominal latitude of 30°S. The section crosses the Santos Plateau and the Vema Channel and ends at the western flanks of the Rio Grande Rise as indicated by *Meteor* Cruise 15 (M15) stations 1–78, January 1991 (according to Speer and Zenk, 1993, with permission of the American Meteorological Society.)

1. To observe and quantify the deep circulation, including the deep boundary currents, within the Brazil Basin. (For this array the DBE objective was extended into the thermocline.)

1a. To observe and quantify spatial and temporal changes of the Brazil Current and its recirculation on scales up to one year;

2. To distinguish between boundary and interior mixing processes;

3. To understand the means by which passages affect the flow of water through them.

WHOI moorings DB1 through DB5 (Deep Basin) were intended to monitor the transport of AAIW, NADW and AABW (Figure 3).

IfM-Kiel moorings BW/333 (Brazil Current West), BM/334 (Middle) and BE/335 (East) were tailored to meet the additional DBE objective, in particular, two upward-looking Acoustic Doppler Current Profilers (ADCPs) were used to measure the top part of the water column.

The small scale of the Vema Sill (Zenk *et al.*, 1993b) required a highly resolved array consisting of mooring VW on the western flanks, VE near the sill, and two moorings DB6 and DBK on the eastern terrace. Mooring VM (Vema Middle) in the central Vema Channel was lost.

Due to resource limitations not all moorings could cover the whole water column. However, we aimed at a consistent and, where possible, equidistant coverage of the NADW and AABW (2500m, 3000m and near bottom). Figures 1 and 3 reveal further instruments on the slope in the upper CPDW, *i.e.* between AAIW and NADW (1400m), in the AAIW itself (900m) as well as the SACW (200m, 500m).

Table 1 gives the correspondence of mooring positions and the closest CTD stations during launch (M15) and recovery (M22) cruises. Complete station inventories are compiled in the cruise reports by Siedler and Zenk (1992) and Siedler *et al.* (1993).

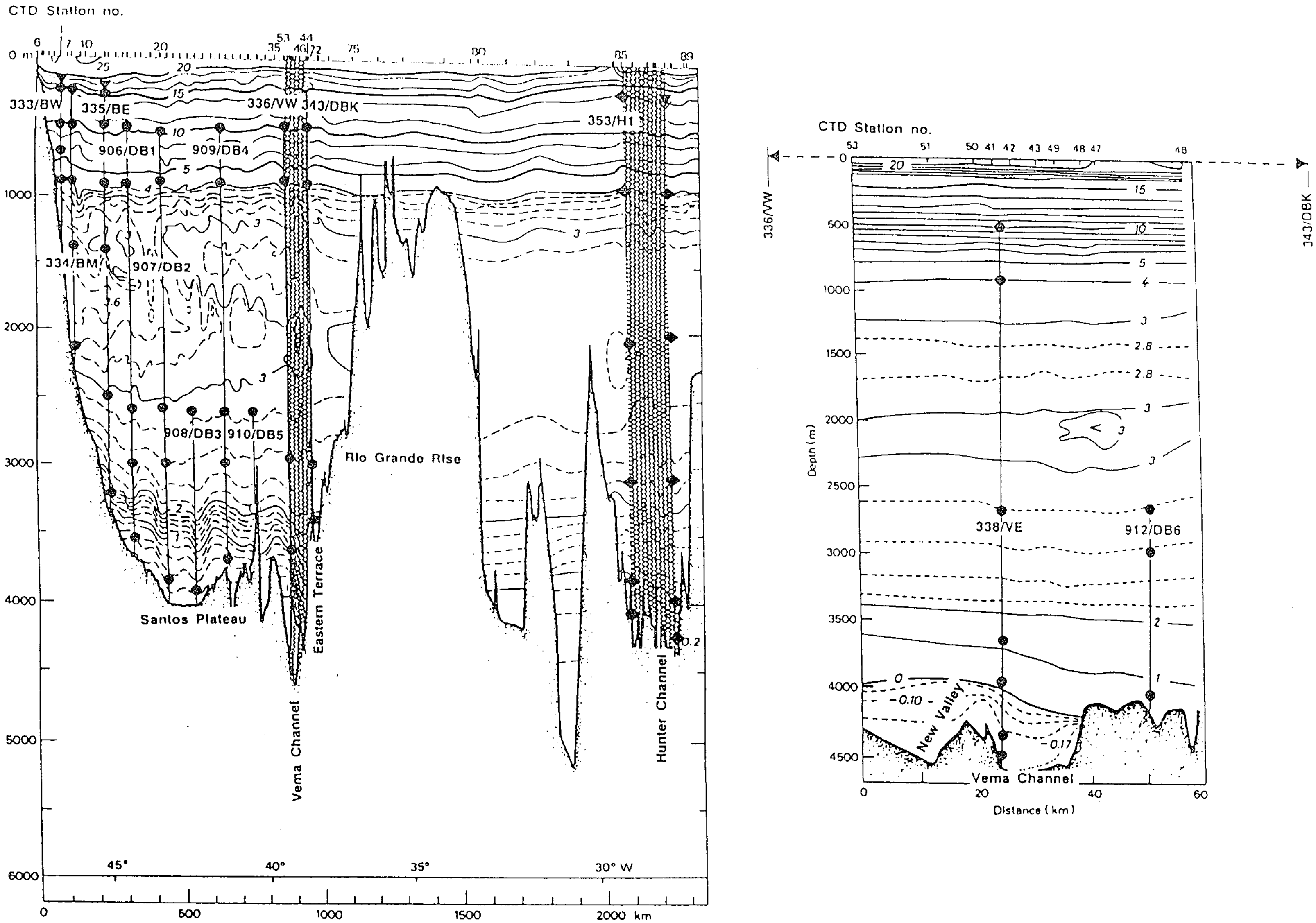

Figure 3: Distribution of current meters, superimposed on a potential temperature (°C) section M14 between *Meteor* Cruises 15 and 22, 1991–1992 (M15/22, dots); and 1992–1993 (M22/28, diamonds). For actual positions see Table 3. Stippled regions highlight the Vema and Hunter Channels where the scale prohibits presentation of all the moorings. Filled circles show recovered current meters and the three triangles give the ADCP locations.

Table 1: Moorings with Corresponding CTD Sections During Launch (M15) and Recovery (M22) Cruises with FS *Meteor*.

Mooring		M15 January 1991					M22 December 1992			
ID	#	Nearest CTD Station #	Nearest CTD Profile #	Nearest CTD Depth (m)	Ship Station #	Estim. Depth (m)	Ship Station #	Nearest CTD Station #	Nearest CTD Profile #	Nearest CTD Depth (m)
Continental Slope										
BW	333	1	1	(2178)	1	1179	558	556	14	1354
BM	334	8	8	2248	8	2187	557	555	13	(1901)
BE	335	12	12	3273	12	3258	550	549	8	3208
Santos Plateau										
DB1	906	16	16	3634	16	3632†	575	575	31	3620
DB2	907	20	20	3922	20	3950†	576	576	32	3919
DB3	908	24	24	4022	24	4019†	577	577	33	4013
DB4	909	28	28	3782	28	3814	579	579	35	(3913)
DB5	910	32	32	3736	32	3721	580	580	36	3727
Vema Channel										
VW	336	36	36	(4979)	36	3965	584	No CTD station taken		
VM+	337									
VE	338	40	40	4668	40	4675*	585	589	42	4601
Eastern Terrace										
DB6	912	46@	46@	4207	39@	4160†	591	594	43	(4567)
		47@	47@	4067						
DBK	343	44	44	3614	44	3652	592	No CTD station taken		

Remarks:

( ) — Depths questionable.

† — Minor differences (O(±5m)) between IfM-Kiel and WHOI log sheets. Depth readings were not taken exactly simultaneously.

+ — Mooring lost.

* — Extremely steep local gradients; depth according to bathymetric survey 4646m.

@ — Mooring position between adjacent CTD stations.

4. Moorings

The moored array described here was a joint undertaking by IfM-Kiel and WHOI. There were seven IfM-Kiel moorings and six WHOI moorings. The mooring positions for both the IfM-Kiel and WHOI moorings were assigned position identifiers to facilitate the recognition of where each mooring was located. Table 2 lists the position identifiers, the associated mooring identifier and the descriptive position location.

Table 2: Mooring Positions

Position id	Mooring #	Descriptive Position location
BW	333	Brazil Current, West
BM	334	Brazil Current, Middle
BE	335	Brazil Current, East
VW	336	Vema Sill, West
VM	337	Vema Sill, Middle
VE	338	Vema Sill, East
DBK	343	Deep Basin, Kiel
DB1	906	Deep Basin, #1
DB2	907	Deep Basin, #2
DB3	908	Deep Basin, #3
DB4	909	Deep Basin, #4
DB5	910	Deep Basin, #5
DB6	912	Deep Basin, #6

Details about mooring location, dates, and instrument depth are shown in Table 3. Representative mooring designs are shown in Figure 4 (IfM-Kiel) and Figure 5 (WHOI).

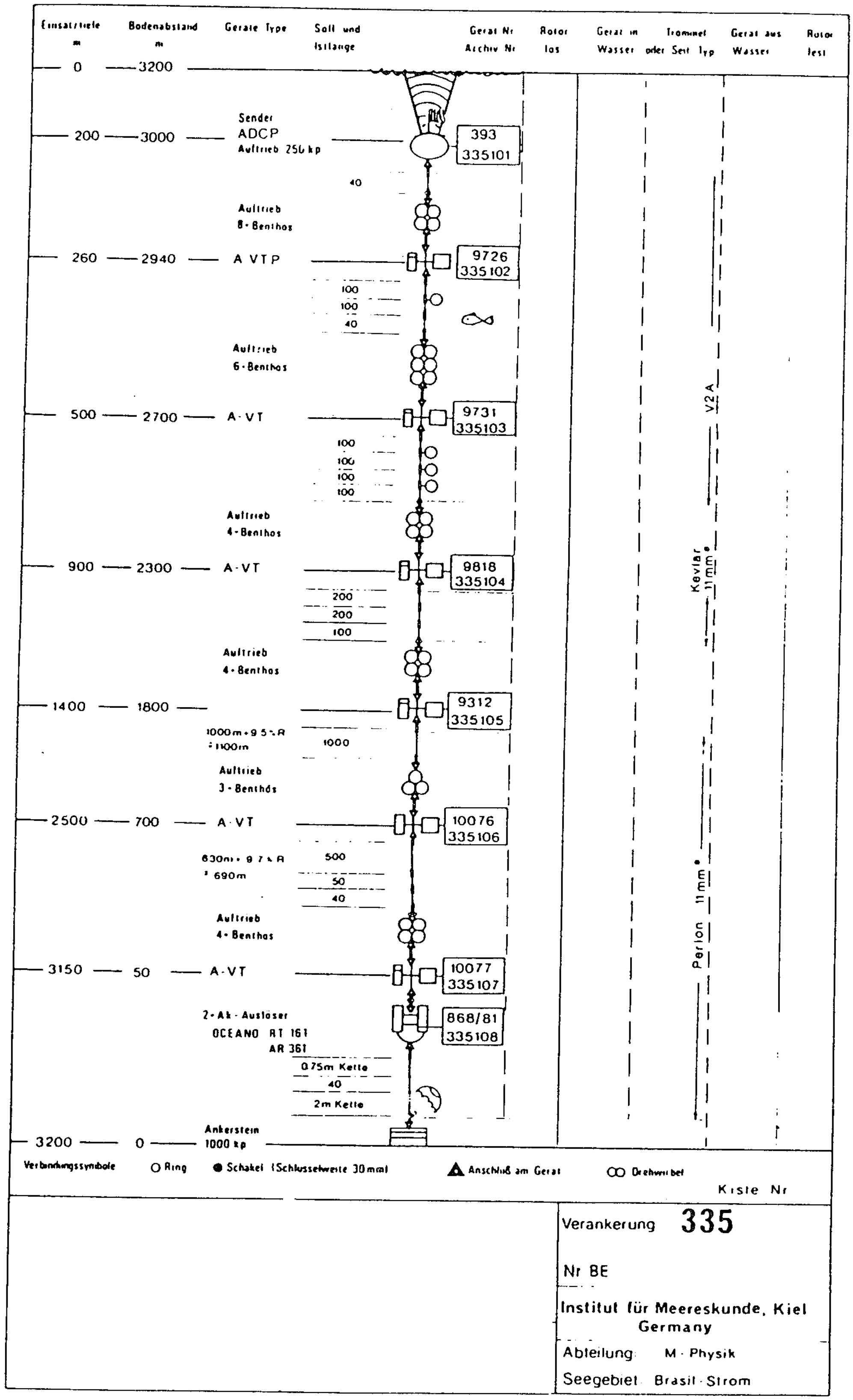

Figure 4: Representative mooring design for IfM-Kiel

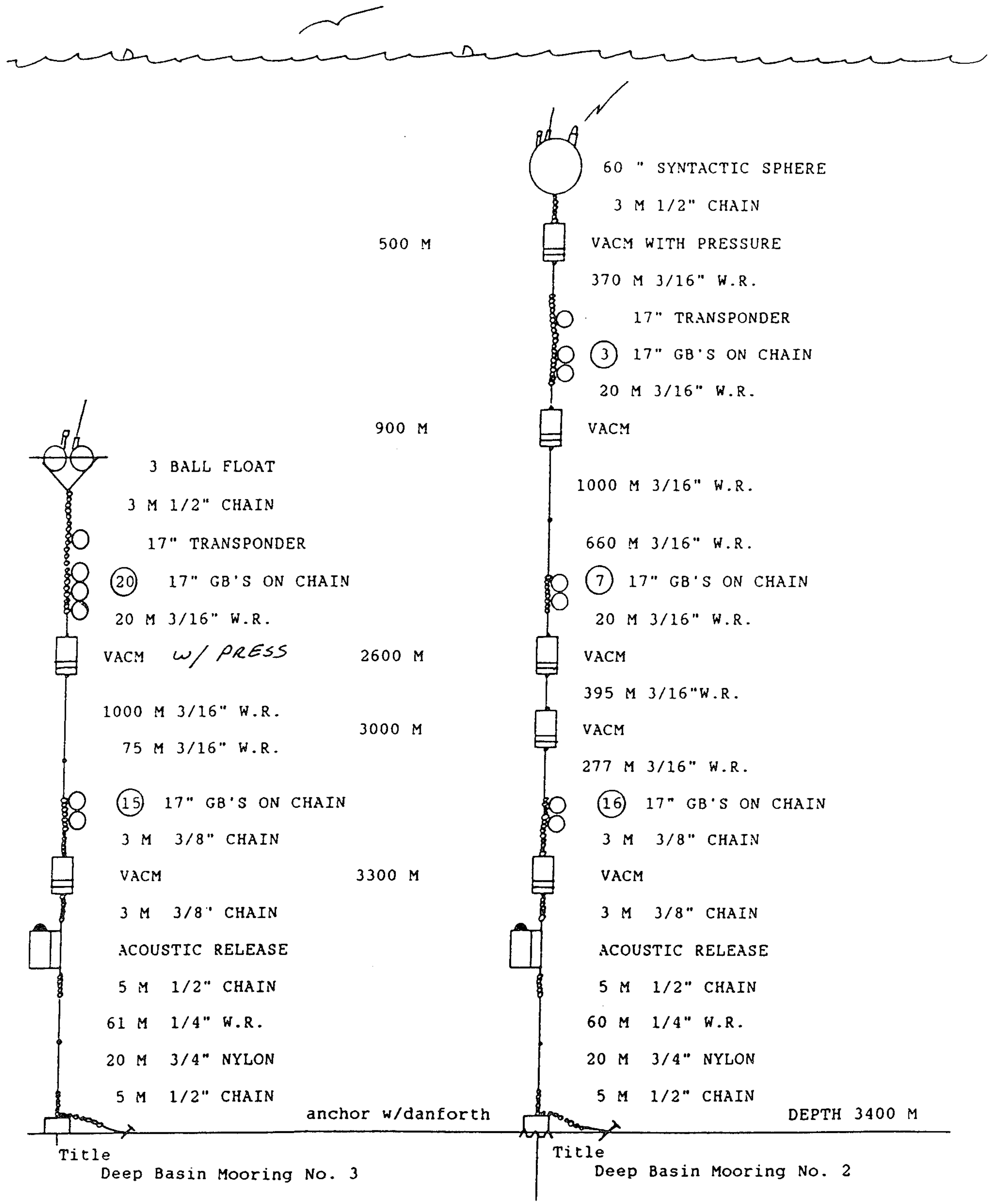

Figure 5: Representative mooring design for WHOI

Table 3: Deep Basin Moorings, Southern Rim of Brazil Basin

Mooring Numbers	Latitude S Deg/Min	Longitude W Deg/Min	Mag Var(W)	Launch yymmdd	Recover yymmdd	No. Data Days
WHOI						
DB1 906	28 27.98	44 27.96	18.5	910104	921203	699
DB2 907	29 02.56	43 29.65	19.5	910105	921204	699
DB3 908	29 32.00	42 42.15	19.0	910106	921204	698
DB4 909	30 05.19	41 44.18	19.5	910107	921205	697
DB5 910	30 34.99	40 47.36	20.0	910108	931009	772
DB6 912	31 04.88	39 09.40	20.5	910111	921207	696
IfM-Kiel						
BW 333	27 54.12	46 42.24	18.0	910101	921127	694
BM 334	27 59.12	46 20.30	17.0	910101	921127	694
BE 335	28 16.12	45 13.48	18.0	910103	921126	692
VW 336	31 12.18	39 46.00	20.5	910109	921206	696
VM 337	31 09.80	39 26.50	20.5	910109	lost	
VE 338	31 08.24	39 26.00	20.5	910111	921206	694
DBK 343	31 09.18	38 49.36	20.5	910112	921207	694

	Instrument Depths (All Depths in Meters)					Water Depth
WHOI						
DB1 906	509	908	2609	3009	3532	3632
DB2 907	496	895	2595	2995	3850	3950
DB3 908			2592		3918	4019
DB4 909	514	914	2614	3013	3714	3814
DB5 910			2597		3621*	3721
DB6 912			2587	2988	4060	4160

	Instrument Depth (All Depths in Meters)											Water Depth
IfM-Kiel												
BW 333	175	220	460	670	875							1179
BM 334		280	530		930	1430	2137					2187
BE 335	235	280	550		950	1450	2545	3208				3258
VW 336			425		840		2970	3590	3915@			3965
VE 338				720	1100		2900	3850	4150	4425	4625	4675†
DBK 343		285‡	525		925		3025	3602				3652

Remarks: * = Instrument Lost; @ = Instrument Flooded; † = Due to the extreme deep topographic gradient this value may differ by about 30 meters; ‡ = No Data.

The moorings were deployed on *Meteor* Cruise 15, leg 1, a voyage that began in Rio de Janeiro on December 30, 1990, and ended there on January 16, 1991. A total of 57 conventional current meters (Aanderaa and VACM) plus two Acoustic Doppler Current Profilers (ADCP) were set on the 13 moorings. CTDs were taken at each mooring site (see Table 1) as well as in between. Additional details of *Meteor* Cruise 15 are given by Siedler and Zenk (1992) and some scientific results, pertinent to the moored array work, are published by Speer *et al.* (1992), Speer and Zenk (1993), and Zenk *et al.* (1993a). Eleven moorings were retrieved on *Meteor* Cruise 22, legs 3 and 4, which originated in Recife on November 18, 1992, and terminated in Rio de Janeiro on December 22, 1992, after a call in Santos (November 30–December 1) giving approximately 23 months of time series data. Again hydrographic stations were taken, although not with such fine spatial resolution as on the first cruise. Details of *Meteor* 22 have been summarized by Siedler *et al.* (1993).

Of the two moorings that were not recovered on *Meteor* 22, one IfM-Kiel mooring is considered lost, the WHOI mooring was partially recovered by dragging for it in October 1993 using a "ship of opportunity", the R/V *Maurice Ewing*, from the Lamont-Doherty Earth Observatory (LDEO). The top part of the mooring, including one instrument, was recovered.

5. Pressure Sensor Performance

The pressure data from the Aanderaa and VACMs were not corrected for sensor drift. Sensor drift for the VACMs was less than 12 decibars. Sensor drift for the Aanderaa instruments was difficult to determine as flotation damage on some moorings during deployment gave the mooring less buoyancy. Table 4 lists the unfiltered pressure minimum

and maximum values. Plots of filtered pressure *versus* time can be seen in the composite plots section.

Table 4: Pressure Sensor Data

Mooring ID	Data Name	Inst. Depth (m)	Minimum Pressure (dbar)	Maximum Pressure (dbar)	Difference (dbar)
DB1	9061	509	503	521	18
DB1	9063	2609	2640	2658	18
DB2	9071	496	489	515	26
DB3	9081	2592	2622	2661	39
DB4	9091	514	489	497	8
DB4	9093	2614	2634	2638	4
DB5	9101	2597	2616	2625	9
DB6	9121	2587	2611	2617	6
BW	333102	220	215	401	186
BW	333103	460	460	615	155
BM	334101	280	242	1041	799
BM	334102	530	456	1193	637
BE	335102	280	242	706	464
BE	335103	550	560	1076	516
VW	336101	425	420	453	33
VW	336102	840	832	857	25
VE	338101	720	690	822	152
VE	338102	1100	1055	1175	116
DBK	343203	925	918	942	24

6. Instrumentation

6.1 Aanderaa Current Meters (RCMs)

With the exception of two instruments (see 6.2) IfM-Kiel exclusively used current meters manufactured by Aanderaa, Inc., Nestun, Norway (Aanderaa, 1983, 1987). Two different models were used: the classical type, RCM5, using an electromechanical encoder with tape recording; and the more advanced vector averaging type, RCM8, with a solid state data memory module. RCM5 instruments were used only in mooring DBK/334.

Both models use paddle wheels or Savonius rotors to measure speed. The whole instrument can spin around the mooring wire guided by a current vane. Directions are observed by an electromechanical compass inside the instrument.

All Aanderaa current meters are equipped with temperature sensors. Optional sensors for pressure and electrical conductivity are available. Where they are not installed, they can be replaced by high resolution thermometers (Arctic range, $-2.64 \leq T < 5.62°C$. Under normal conditions all non-current sensors are calibrated before and after instrument deployment at IfM-Kiel.

Basic internal differences between RCM5 and RCM8 are summarized in Table 5.

Table 5: Characteristics and Technical Differences between Aanderaa Current Meter Types RCM5 and RCM8 used by IfM-Kiel in the DBE Array

Aanderaa Type	Manufactured	Data Storage	Vector Avg.	Time Rec.	Rotor Sensor	Sample Interval	Elementary Sample
RCM5	1965-1990	Magnetic Tape	No	No	R or P	120 min	1
RCM8	> 1987	Solid State	Yes	Yes	P	120 min	80-100*

* = Instrument-dependent; originally uninfluenced by operator.
R = Savonius rotor
P = Paddle wheel

CTD data were used to adjust the temperatures in the time series from the IfM-Kiel moorings.

6.2 Acoustic Doppler Current Profilers (ADCPs)

Moored ADCPs record the three-dimensional current components. They range up to about 300m, typical vertical resolution is of the order of 8m. Forty-five bins were chosen for the total profile. Internal calculations yield instrument inclination (pitch and roll) and orientation (heading) against magnetic north (flux gate compass).

ADCPs utilize Doppler frequency shifts for speed observations. A pulse of 153 kHz is radiated from four different transducers. Elementary measurements (pings) are ensembled, averaged and are stored in Electrical Programmable Read Only Memories (EPROMs). The accuracy of the ping data depends on ray inclination and the number of bins chosen. The manufacturer's specification indicates an accuracy of 2-6 cm s^{-1} for the horizontal components (RDI, 1989). Ensemble averaging increases this modest accuracy by a factor of 2–4.

In addition to the three-dimensional current distribution, an "error" velocity is measured. It contains a measure for the heterogeneity of the current field (Visbeck, 1993).

6.3 Vector Averaging Current Meters (VACMs)

Vector averaging current meters (VACMs) were developed at WHOI in the early 1970's and were built by EG&G Ocean Products. They use a Savonius rotor to measure current flow, an external vane to measure the instrument's orientation to the current, and an internal compass to measure the instrument's orientation to magnetic north. Temperature is measured with a thermistor mounted in the end cap of the instrument. The VACM uses a crystal-controlled time reference with an accuracy to within one second per day. The "clock" is synchronized with Universal Temps Coordonne (UTC) before deployment and the accrued error recorded after recovery. The VACM continuously sums vector increments

of water flow sensed by the rotor and vane. At regular intervals, for this deployment every fifteen minutes, it records on a magnetic tape cassette the accumulated east–west and north–south velocities. The calibration of the VACM and its recording technique were discussed by McCullough (1975). Temperature values are averaged over the entire recording interval of 15 minutes for those instruments that do not measure pressure. The instruments that have both a pressure and temperature sensor are multiplexed, that is they time-share the recording interval and average each sensor's input for one half the recording interval (7.5 minutes). Payne *et al.* (1976) discussed the accuracy of the temperature measurements. The WHOI temperature sensors were calibrated in the laboratory both before and after deployment. The pressure sensor is a strain gauge with a manufacturer's specified accuracy of about 0.1%, or 3 decibars for a standard 3,000 decibar pressure transducer. The pressure transducers are calibrated both before and after deployment.

7. Data Processing

The initial data processing for each instrument was done independently at the originating institution for that instrument. Some additional processing, including the low-passed filtering was done at WHOI.

7.1 Aanderaa – IfM-Kiel

The data processing followed the usual procedures. Data were transferred to DOS formatted disc files. In the case of RCM5 instruments a tape reader was needed. Alternatively, the data flow from the RCM8 instruments is directed by an interface box controlling the attached Data Storing Unit of the individual current meters. Both devices–tape reader

and I/F box–provide a serial output, RS232. The raw data were edited and converted into engineering units.

Although the vector averaging scheme of the RCM8 uses a cartesian coordinate system internally, raw data from this instrument group are converted again to polar coordinates prior to storage. This transformation makes RCM5 and RCM8 nominally compatible for the subsequent processing. Calibration polynomials are applied to records of temperature, pressure, speed and direction. Inferred quantities, like zonal (U) and meridional (V) current components are calculated simultaneously. The magnetic deviation (shown in Table 3) had to be considered as well.

The following processing steps included time base controls, truncation, removal of bad data and spikes. Finally depths of instruments were corrected against pressure records and with consideration of the mooring designs.

Further processing of the Aanderaa data was done at WHOI to remove an artificial gap in the direction data that occurred at 360° minus the magnetic variation correction. It appeared that the data that should have been in the gap had been forced to become values on either side of the gap. It further appeared that zero velocities were frequently associated with this phenomenon. Therefore, a simple program was written to test for all cases when the direction was between 335° and 345°, and the speed was zero. If both cases were true, the data from that record would become a linearly interpolated value. Table 6 lists the results of this program. A brief assessment of data quality for each instrument is shown in Table 8b.

Table 6: Number of Data Cycles changed (by linear interpolation) to Compensate for the Artificial Hole in Direction

Date ID	# data cycles	# speed = zero	# directions between 335° and 345°	# paired interpolated values
BW/333102	8327	123	42	6
BW/333103	8327	157	49	1
BW/333104	8327	905	200	10
BW/333105	8327	1437	592	55
BM/334101	8327	331	131	4
BM/334102	8327	478	114	6
BM/334103	8327	1547	231	36
BM/334104	8327	1613	195	50
BM/334105	8327	2448	228	85
BE/335102	8306	287	413	181
BE/335103	8306	1553	200	40
BE/335104	8306	2333	171	59
BE/335105	8306	2498	2367	2187
BE/335106	8306	2500	345	107
BE/335107	8306	1947	240	93
VW/336101	7545	17	233	0
VW/336102	8352	916	239	30
VW/336103	8365	803	571	49
VW/336104	8351	648	1070	55
VE/338101	8330	692	269	14
VE/338102	8330	2646	248	80
VE/338103	8330	3245	2504	2437
VE/338104	8329	1515	612	50
VE/338105	8330	89	447	2
VE/338106	8330	1	6550	0
VE/338107	8330	16	2428	1
DBK/34322	8330	289	4	0
DBK/34323	4106	412	1993	320
DBK/34324	8330	768	246	19
DBK/34325	8330	1403	1078	996

The frequency of erroneous zero values in the U and V components of RCM8 instruments is not totally unexpected. Similar experiences with the high threshold speed are documented by Arhan *et al.* (1991). Further analysis is underway. There is a strong suspicion that the poor performance of the vector averaging Aanderaa current meter (type RCM8) is caused by the shortness of the individual samples. The integration time appears to be insufficient to match sampling needs at low speeds.

7.2 ADCP – IfM-Kiel

The overall performance of the two moored Acoustic Doppler Current Profilers (on the top of moorings BW/333 and BE/335) was excellent. Because the Deep Basin Experiment concentrates on the subthermocline circulation in the subtropical South Atlantic, we have decided to display only selected time series from the two ADCPs. Three velocity time series from each ADCP, at selected depths, were chosen to be displayed. Also displayed are the auxiliary quantities of pitch, roll and heading plus the temperature at the instruments' end plates (Table 7).

Table 7: Selection of ADCP Parameters

Id/data Name	Bin #	Nominal Depth(m)	Parameters selected and shown here
BW/333101	14	50	U,V,w,e
	7	120	U,V,w,e
	1	170	U,V,w,e
	0	175	pitch,roll,heading,temp.
BE/335101	21	50	U,V,w,e
	11	140	U,V,w,e
	3	220	U,V,w,e
	0	235	pitch,roll,heading,temp.

U, V components = zonal, meridional components; w = vertical speed; e = "error" velocity; Bin # (0) = parameters within the instrument itself

7.3 VACM – WHOI

Data from instrument cassettes (VACMs) were read onto a DOS formatted disc. A special interface card in the PC is needed for this transfer. The data were then transferred from the PC disc to a VAX disc in the BUOY format (Maltais, 1969).

Each time series went through a sequence of programs (Tarbell *et al.,* 1988) that checked the time base and converted the data into scientific units. Then the quality of the data was determined (Table 8a).

Next the individual variables were edited to remove miscellaneous bad points and the launch and retrieval transients. Finally the Best Basic Version (BBV) was created by linearly interpolating through gaps in the data to make an evenly spaced time series. This series is the basis for all further processing. Finally a Gaussian filtered series is created from the BBV with a half-width of 24 hours and subsampled to have one point a day. The Gaussian-filtered time series were used to create all the data displays in this report. A brief assessment for each instrument is shown in Table 8b.

Table 8a: Deep Basin Data Quality—WHOI

Name	Depth		Comments
9061	509	Data	- Last 4 months of data missing, because of tape advance problems.
			- Pressure drift was less than 2 dbars.
		Instrument	- Bottom rotor pivot screws loose.
			- Failed self compute test.
9062	908	Data	- Good.
		Instrument	- Good.
9063	2609	Data	- Rotor sticking after May 31, 1992.
			- Pressure drift of about 11 dbars.
		Instrument	- Top rotor pivot screws loose.
9064	3009	Data	- About 2 months of data available.
		Instrument	- Low tape usage.
			- Rotor out of pivots
9065	3532	Data	- Raw data look good but comparison with other array data looks suspect.
		Instrument	- Compass failed post cruise check. Not known if failure occurred during shipping or while deployed on mooring.
9071	496	Data	- Only 2 months of rotor data. Time series short by 1.5 months.
			- Pressure drift of about 6 dbars.
		Instrument	- Rotor completely out of pivots.
			+ (positive) logic battery very low.
9072	895	Data	- Only 3 months of data.
		Instrument	- Low tape usage.
			- Very low motor driver supply.
9073	2595	Data	- Good.
		Instrument	- Good.

Table 8a: Continued

Name	Depth		Comments
9074	2995	Data	- Use low-passed data with care.
			- Do not use basic data as there are too many gaps in the time series.
			- Gaps in basic data caused by tape reading problems.
9075	3850	Data	- Good.
		Instrument	- Screws on upper rotor pivot loose.
9081	2592	Data	- Good; strong eddy.
			- Pressure drift of about 10 dbars.
		Instrument	- Good.
9082	3918	Data	- Good; strong eddy.
		Instrument	- Rotor has loose screws on bottom pivot but rotor still spins freely.
9091	514	Data	- Good; beautiful lunar signal in pressure.
			- Pressure drift of about 5 dbars.
		Instrument	- Good.
9092	914	Data	- Good.
		Instrument	- Good.
9093	2614	Data	- Good.
			- A beautiful lunar signal in pressure.
			- Pressure drift of about 2 dbars.
		Instrument	- Good.
9094	3013	Data	- No sea data.
		Instrument	- Tape jammed about Dec 29, 1991.
9095	3714	Data	- Good.
		Instrument	- Good.

Table 8a: Continued

Name	Depth		Comments
9101	2597	Data	- Good. Mooring recovered by dragging - data continues until Feb 19, 1993; - pressure drift of about 3 dbars.
		Instrument	- Instrument recovered by dragging. - Tape full.
9102	3621	Data	- No data; instrument not recovered.
9121	2587	Data	- Good. - Pressure drift of -4 dbars then $+4$ dbar.
		Instrument	- Good.
9122	2988	Data	- Use low passed data with care. - About 5% of the basic series are interpolated values.
9123	4060	Data	- Tape reading problems caused many errors in the data. - About 2% of the basic series are interpolated values.
		Instrument	- Rotor has one loose screw.

Table 8b: Deep Basin Data Quality–IfM-Kiel

Name	Depth		Comments
333		Mooring	- The uppermost buoyancy-element was damaged. Perhaps the whole mooring, including anchor, moved downslope caused by large current drag.
333101	175	Data	- ADCP first results adequate (100% data). - Temp shows the same dives as the ACM below.
		Instrument	-
333102	220	Data	- Strong pressure events of about 180 dbars.
		Instrument	- Rotor stuck for 10 days in Sept 1992.
333103	460	Data	- Good. Strong pressure events of 150 dbars.
		Instrument	-
333104	670	Data	- Threshold problem in speed (and, therefore, in U,V).
		Instrument	-
333105	875	Data	- Threshold problem in speed.
		Instrument	-
334		Mooring	- The uppermost buoyancy-element was damaged.
334101	280	Data	- Strong dives of 700 dbars maximum. - Jump of 35 dbars in pressure after first big dive.
		Instrument	-
334102	530	Data	- Good.
		Instrument	-
334103	930	Data	- Threshold problem in speed.
		Instrument	- Rotor stuck for 10 days in early August.
334104	1430	Data	- Threshold problem in speed.
		Instrument	-
334105	2137	Data	- Threshold problem in speed.
		Instrument	-

Table 8b: Continued

Name	Depth		Comments
335101	235	Data	- Data before February 13 not included due to technical difficulties.
		Instrument	- ADCP buoyancy was damaged upon recovery.
335102	280	Data	- Strong pressure events of about 450 dbars. - 40 db pressure drop after major event.
		Instrument	- Rotor lost.
335103	550	Data	- Initial pressure values removed because of unreasonable data. It seems to be a sensor problem. - Threshold problem in speed.
		Instrument	-
335104	950	Data	- Threshold problem in speed.
		Instrument	-One of 6 rotor paddles lost upon recovery.
335105	1450	Data	- Many zero counts in speed and direction. An instrument, not a data processing problem.
		Instrument	-
335106	2545	Data	- Threshold problem in speed.
		Instrument	-
335107	3208	Data	- Threshold problem in speed.
		Instrument	-
336101	425	Data	- No registration until March 18, 1991. - Time base relies on recovery check only. - No threshold problem in speed!!
		Instrument	-
336102	840	Data	- Good.
		Instrument	- Good.
336103	2970	Data	- Good.
		Instrument	- Good.

Table 8b: Continued

Name	Depth		Comments
336104	3590	Data	- Two-month loss of data (Aug, Sept 1992) caused by tape reading problem.
		Instrument	-
336105	3915	Data	- No data.
		Instrument	- End plate of Aandraa lost. Instrument flooded.
337		Mooring	- Mooring lost.
338101	720	Data	- Step of 50 dbars in pressure signal. - Rotor sticking for 10 days in Sept 1992.
		Instrument	-
338102	1100	Data	- Strange pressure signal, step of 50 dbars. - Threshold problem in speed.
		Instrument	- One of six rotor paddles lost on recovery.
338103	2900	Data	- Significant threshold problem in speed.
		Instrument	-
338104	3850	Data	- Threshold problem in speed.
		Instrument	-
338105	4150	Data	- Good.
		Instrument	- Good.
338106	4425	Data	- Good.
		Instrument	- Rotor damaged upon recovery.
338107	4625	Data	- Good.
		Instrument	- Good.

Table 8b: Continued

Name	Depth		Comments
343201	285	Data	- No data. Registration failed, no obvious reason.
		Instrument	-
343202	525	Data	- Tape reading and/or registration problems. - Stuck rotor in Feb 1992. - Time series divided into two parts: - a) Jan – Aug 1991, b) Jan – June 1992.
		Instrument	- End plate was damaged.
343203	925	Data	- Only one year of registration (auxiliary battery failed). - Threshold problem in direction.
		Instrument	-
343204	3025	Data	- Good.
		Instrument	- Good.
343205	3602	Data	- Threshold problem in speed and direction.
		Instrument	-

Remark: Similar problems with the threshold speed are documented by Arhan *et al.* (1991) who performed a series of tests on Aandreaa current meters in their tow tank facility.

8. Data Identification

8.1 IfM-Kiel

Each time series is identified by a 6 digit ($XXXYZZ$) mooring number. XXX contains a sequential mooring number, Y identifies repeated launches at the same location, and ZZ stands for the instrument position number counted from above.

Mooring DBK/343 was launched twice. The first launch yielded no data. This report contains the time series from the second (successful) launch, hence its identification is 3432*ZZ*.

8.2 WHOI

Each time series is identified by a mooring number, a sequential instrument position number, a letter to indicate the data version, and numbers to indicate the sampling rate. Therefore, 9081B900 identifies data from the first instrument on mooring 908; the version is B, and the sampling rate is one record every 15 minutes (900 seconds). 9081B1DG24 is a time series that has had a Gaussian filter (G) applied to the data; the filter has a half width of 24 hours (24) and is subsampled once a day (1D).

9. Descriptions of Data Displays

The first two pages are lists of the statistics for each time series. Following the statistics, the plots are ordered by mooring position from West to East (Figure 1). Data from each mooring are displayed on four consecutive pages, except for the two moorings with ADCP data. Each set of ADCP data (three current time series plus extra variables from the ADCP) are shown on five additional pages that precede the four current meter pages for that mooring.

9.1 Statistics

Statistics of U, V and temperature from the filtered time series are included in Table 7 at the beginning of the data presentation section. The ADCP current time series do not

have an associated temperature; therefore those series display only the statistics for U and V. The equations used to derive the statistical parameters are described by Tarbell *et al.* (1988). Table 9 describes the column headings for the statistical table. Units for velocity are cm/sec and for temperature are in °C.

Table 9: Description of Column Headings for Statistical Table

Column #	Caption	Description
1	Data id	DBE mooring designation; institutional sequential number.
2	depth	Depth of the instrument in meters or, in the case of the ADCP, the depth of the components.
3	# dc	Number of data cycles, which also corresponds to the number of days of data.
4	U	Mean of the east velocity component.
5	V	Mean of the north velocity component.
6	K.m	Kinetic energy of the mean.
7	U'^2	Variance of the east component.
8	V'^2	Variance of the north component.
9	K.e	Eddy kinetic energy.
10	$U'V'$	Co-variance of east and north.
11	T	Mean temperature.
12	$\sqrt{T'^2}$	Standard deviation of temperature.
13	$U'T'$	Co-variance of east component and temperature.
14	$V'T'$	Co-variance of north component and temperature.

9.2 Progressive Vector Plots

Progressive vector diagrams are representative for low-frequency motions recorded by the current meters. Current vectors are placed head to tail to show the path a particle would have traveled in a perfectly homogeneous flow. The plot begins with an asterisk followed by annotated triangles at the first of each month. Each page displays the plots from one mooring. On all moorings (except 338) the start asterisk (*) is positioned on a vertical line. On a few moorings, where the km/inch scale is greatly different over the depth range, two different km/inch scales have been used.

9.3 Variables *versus* Time

The composite stick plots, which show individual current vectors as arrows along the time scale, are plotted with the available pressure data for the mooring. The velocity and pressure scales differ for each mooring to best display the character of the measured currents.

Composite temperature plots also use different scales within the same mooring to highlight temperature fluxuations.

A third set of composite plots displays the individual east and north components for each mooring.

10. Acknowledgements

Foremost we thank D. Carlsen and A. Kipping (IfM-Kiel) and Scott Worrilow, Dave Simoneau and Kent Bradshaw (WHOI) for their technical help in mooring design and

and implementation. Their close cooperation with colleagues from the Oceanographic Institute of São Paulo University (IOUSP) and the University of Rio de Janeiro has made our mooring efforts a great success. Special thanks go to the captains and crews of the Research Vessels *Meteor* and *Ewing*. Repeated encouragement and support was provided by G. Siedler. T. J. Müller, chief scientist on the *Meteor* recovered moorings BW, BM and BE. Not forgotten is the excellent cooperation with Y. Ikeda, University of São Paulo, and the staff of German diplomatic representatives in both Brasilia and Rio de Janeiro who helped to clear all necessary allowances from Brazilian authorities. Thanks go to Mike Rawson, Marine Department at LDEO, and the captain and crew of the R/V *Ewing* for their contributions to the dragging effort that, under the direction of Scott Worrilow in October 1993, recovered part of a "lost" DBE mooring. Thanks also to Penny Foster (WHOI) for her assistance in typing this report.

Financial support for this project came from: Deutsche Forschungsgemeinschaft (Si 111/38-1. Si 111/39-1) Bundesministerium für Forschung und Technologie (03F0535A, 03F0050D, F0121A) and the National Science Foundation Grant OCE -9004396.

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Table 10: Statistical Values from Southern Boundary of the Brazil Basin

Data id	depth	#dc	U	V	K.m	U′²	V′²	K.e	U′V′	T	$\sqrt{T'^2}$	U′T′	V′T′
DB1/906-1	509	573	−2.5	0.2	3.1	54.7	40.2	47.4	−0.2	11.01	.889	−1.512	−1.732
DB1/906-2	908	697	−4.2	0.6	8.8	26.6	17.8	22.2	2.9	4.42	.259	−0.143	−0.378
DB1/906-3	2609	512	−5.3	−0.2	14.0	31.9	32.5	32.2	13.0	3.09	.051	0.093	0.025
DB1/906-5	3532	697	-0.6	−1.1	0.8	26.1	18.4	22.3	9.8	0.89	.139	0.094	−0.018
DB2/907-1	496	64	−2.5	−5.4	17.4	30.8	110.7	70.8	−8.0	10.47	.780	−0.666	3.718
DB2/907-2	895	96	−6.5	−2.5	24.1	64.4	59.6	62.0	−9.5	4.46	.288	−1.355	0.078
DB2/907-3	2595	696	−3.0	1.5	5.6	46.5	29.0	37.7	3.8	3.11	.060	0.047	0.018
DB2/907-4	2995	696	−2.6	2.0	5.5	54.3	38.8	46.5	3.6	2.76	.078	0.112	0.079
DB2/907-5	3850	696	1.0	4.7	11.6	33.8	42.8	38.3	−7.8	0.57	.069	0.074	−0.077
DB3/908-1	2592	696	−1.5	0.2	1.2	29.0	21.0	25.0	0.5	3.14	.044	−0.032	0.013
DB3/908-2	3918	696	0.0	−0.1	0.0	41.3	28.8	35.1	1.6	0.62	.052	0.005	0.105
DB4/909-1	514	695	−2.8	−0.8	4.2	12.7	25.1	18.9	−1.7	11.00	.615	−0.515	1.081
DB4/909-2	914	695	−2.2	−0.6	2.5	5.6	11.2	8.4	-1.5	4.47	.226	−0.129	0.044
DB4/909-3	2614	695	0.9	−1.5	1.6	14.0	16.4	15.2	−1.5	3.13	.034	−0.005	0.023
DB4/909-5	3714	695	−0.2	−2.1	2.3	7.0	7.7	7.4	-2.1	0.89	.138	−0.049	−0.009
DB5/910-1	2597	771	−0.1	−1.0	0.5	9.3	11.7	10.5	−0.2	3.12	.040	0.049	−0.048
DB6/912-1	2587	694	0.6	−0.9	0.6	7.2	12.5	9.9	−3.7	3.06	.039	0.012	−0.005
DB6/912-2	2988	694	0.9	−1.4	1.3	10.7	14.8	12.8	−3.7	2.83	.042	0.011	−0.007
DB6/912-3	4060	694	0.6	−1.0	0.7	6.3	11.4	8.8	0.6	1.04	.131	−0.043	−0.110

Table 10: Continued

Data id	depth	#dc	U	V	K.m	U'^2	V'^2	K.e	U'V'	T	$\sqrt{T'^2}$	U'T'	V'T'
BW/333101	50	692	−16.0	−30.4	590.4	271.9	506.5	389.2	58.0				
BW/333101	120	692	−15.8	−30.2	581.5	262.5	499.8	381.1	60.8				
BW/333101	170	692	−15.1	−27.9	503.5	203.7	407.8	305.8	46.3				
BW/333102	220	692	−14.3	−25.91	437.6	159.7	362.3	261.0	45.6	16.90	1.427	0.222	−1.1597
BW/333103	460	692	−8.5	−13.5	127.3	45.2	137.9	91.6	15.0	11.11	0.958	−0.390	−1.138
BW/333104	670	692	−3.3	−5.1	18.6	22.2	100.0	61.1	−5.4	6.89	0.642	0.328	−1.977
BW/333105	875	692	−1.8	0.8	2.0	8.7	122.5	65.6	−10.1	4.57	0.256	0.121	−1.426
BM/334101	280	692	−6.0	−8.4	53.3	132.9	157.5	145.2	−15.1	15.27	1.910	3.571	6.947
BM/334102	530	692	−5.0	−6.1	31.3	58.5	79.0	68.8	−4.3	10.38	1.503	1.864	2.682
BM/334103	930	692	−2.5	−3.0	7.5	25.0	40.9	33.0	1.5	4.47	0.272	0.049	0.054
BM/334104	1450	692	−1.3	−2.9	5.1	11.7	33.0	22.3	7.1	3.49	0.099	−0.023	−0.034
BM/334105	2137	692	0.3	1.2	0.8	8.7	29.2	19.0	12.3	3.56	0.110	−0.052	−0.064
BE/335101	50	650	−0.1	2.7	3.8	314.1	196.5	255.3	39.8				
BE/335101	140	650	−0.8	1.8	1.9	220.8	122.1	171.5	30.7				
BE/335101	220	650	−1.2	1.3	1.6	161.1	86.4	123.7	21.7				
BE/335102	280	690	−1.3	1.2	1.6	183.1	113.2	148.2	23.2	15.15	1.224	−3.627	−2.528
BE/335103	550	690	−1.2	0.4	0.8	82.1	42.8	62.5	6.5	10.33	1.009	−2.239	−1.010
BE/335104	950	690	−1.3	−0.5	1.0	27.9	10.9	19.4	0.7	4.31	0.211	0.040	−0.035
BE/335105	1450	690	−3.6	−1.6	7.6	24.3	22.1	23.2	2.3	3.25	0.173	0.130	−0.138
BE/335106	2545	690	−2.3	−1.4	3.8	9.8	27.5	18.6	0.8	3.20	0.058	−0.050	−0.027
BE/335107	3208	690	1.7	4.6	12.1	7.8	42.5	25.2	14.5	1.23	0.331	−0.321	−0.977
VW/336101	425	627	−3.5	1.1	6.8	42.6	32.9	37.8	−6.5	12.53	0.484	−1.149	0.459
VW/336102	840	694	−1.6	−0.3	1.3	11.7	10.2	10.9	−2.4	5.02	0.316	−0.457	−0.065
VW/336103	2970	695	0.3	0.5	0.2	5.0	24.7	14.8	−6.0	2.76	0.035	−0.006	0.061
VW/336104	3590	575	−1.6	3.8	8.3	5.7	18.9	12.3	−8.5	1.32	0.213	0.145	−0.285

Table 10: Continued

Data id	depth	#dc	U	V	K.m	U'^2	V'^2	K.e	U'V'	T	$\sqrt{T'^2}$	U'T'	V'T'
VE/338101	720	692	−3.3	0.4	5.7	39.9	25.2	32.6	−8.5	9.31	0.709	−1.196	−0.045
VE/338102	1100	692	−1.5	0.0	1.2	10.2	9.8	10.0	−3.9	3.98	0.195	−0.147	−0.009
VE/338103	2900	692	1.1	−2.3	3.2	8.9	13.8	11.3	−6.2	3.12	0.044	0.042	−0.061
VE/338104	3850	692	−1.9	3.5	7.9	23.8	42.9	33.4	−21.6	1.24	0.143	0.261	−0.416
VE/338105	4150	692	−11.8	13.5	160.6	67.0	43.3	55.1	−46.5	0.39	0.127	−0.009	−0.123
VE/338106	4425	692	−13.2	33.7	654.7	18.6	72.4	45.5	−34.0	0.19	0.015	0.017	−0.020
VE/338107	4625	692	−6.8	29.3	452.1	2.8	82.1	42.5	−9.3	0.22	0.017	0.000	−0.031
DBK/343202	525	167	−8.0	0.9	32.1	8.3	4.8	6.5	−0.6	10.54	0.320	−0.149	0.073
DBK/343203	925	340	−1.4	3.6	7.3	9.6	21.2	15.4	−10.8	4.11	0.231	−0.178	0.313
DBK/343204	3025	692	−1.3	−0.6	1.1	7.1	9.4	8.2	−2.6	2.37	0.052	−0.001	0.053
DBK/343205	3602	692	−0.4	−4.3	9.3	4.3	25.2	14.8	−1.5	1.89	0.170	−0.022	0.466

Note: All time series begin in January 1991 except 336101 and 343202, which begin in March 1991; and the velocity statistics from the ADCP on 335, which begin in February.

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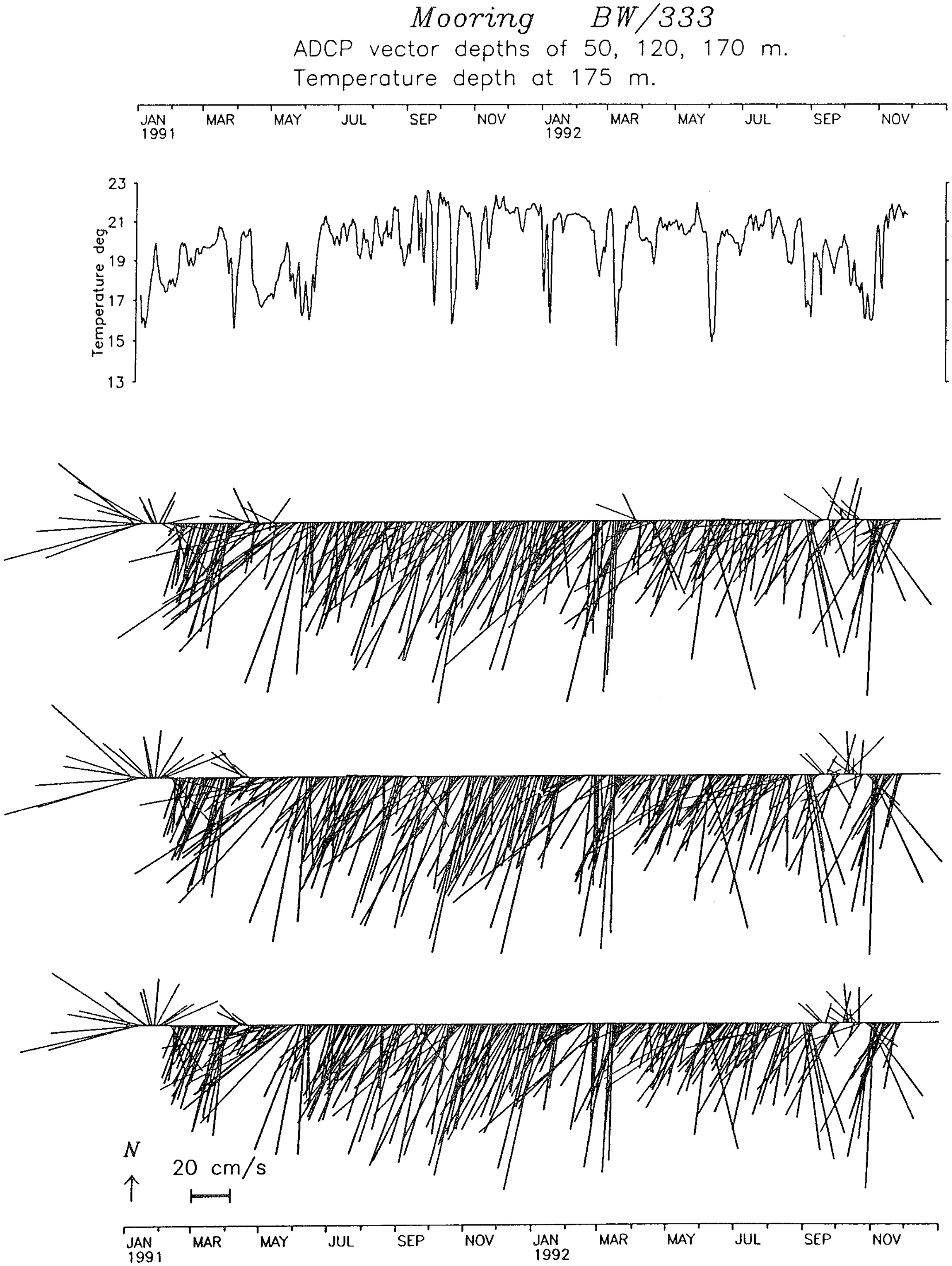
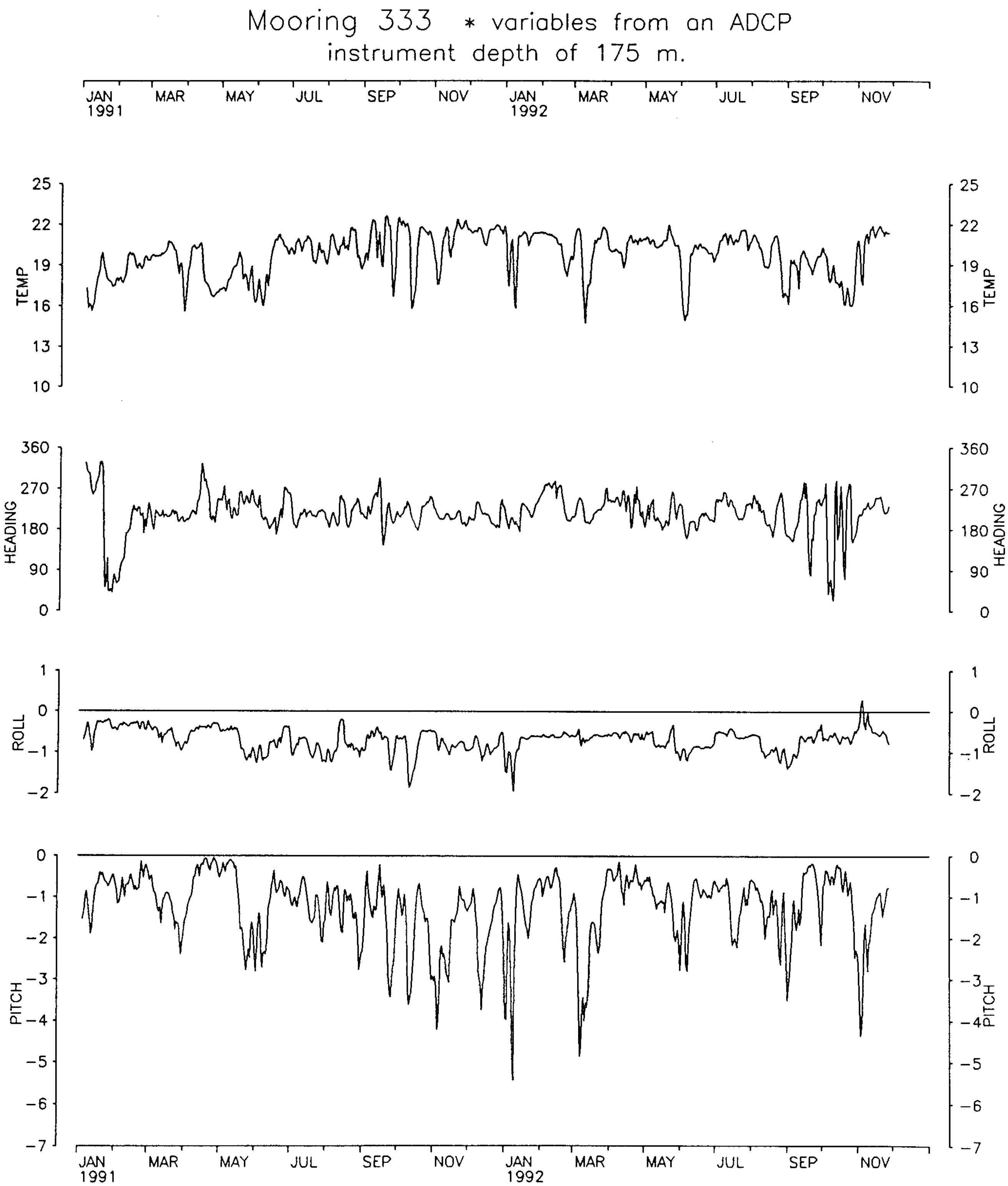
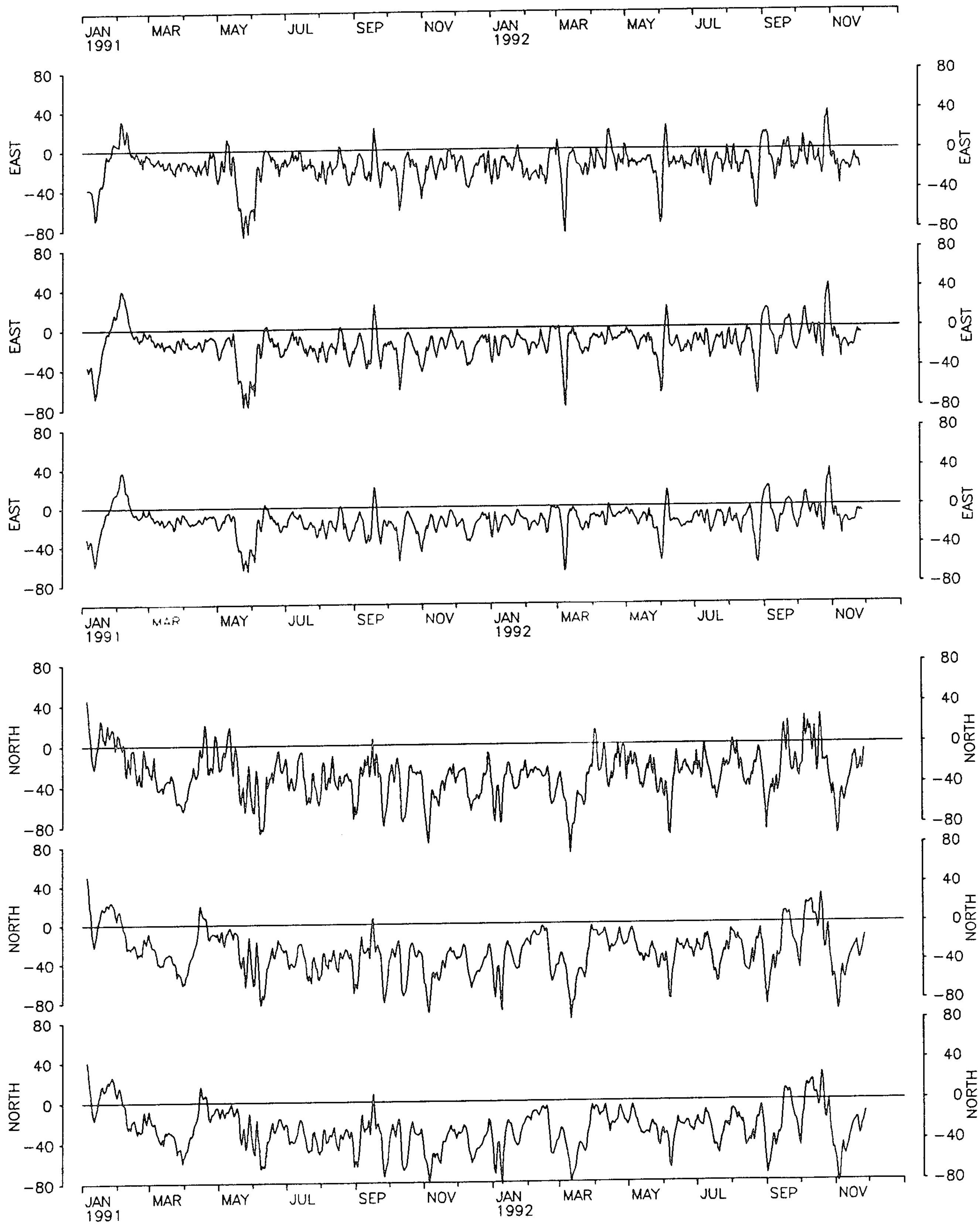
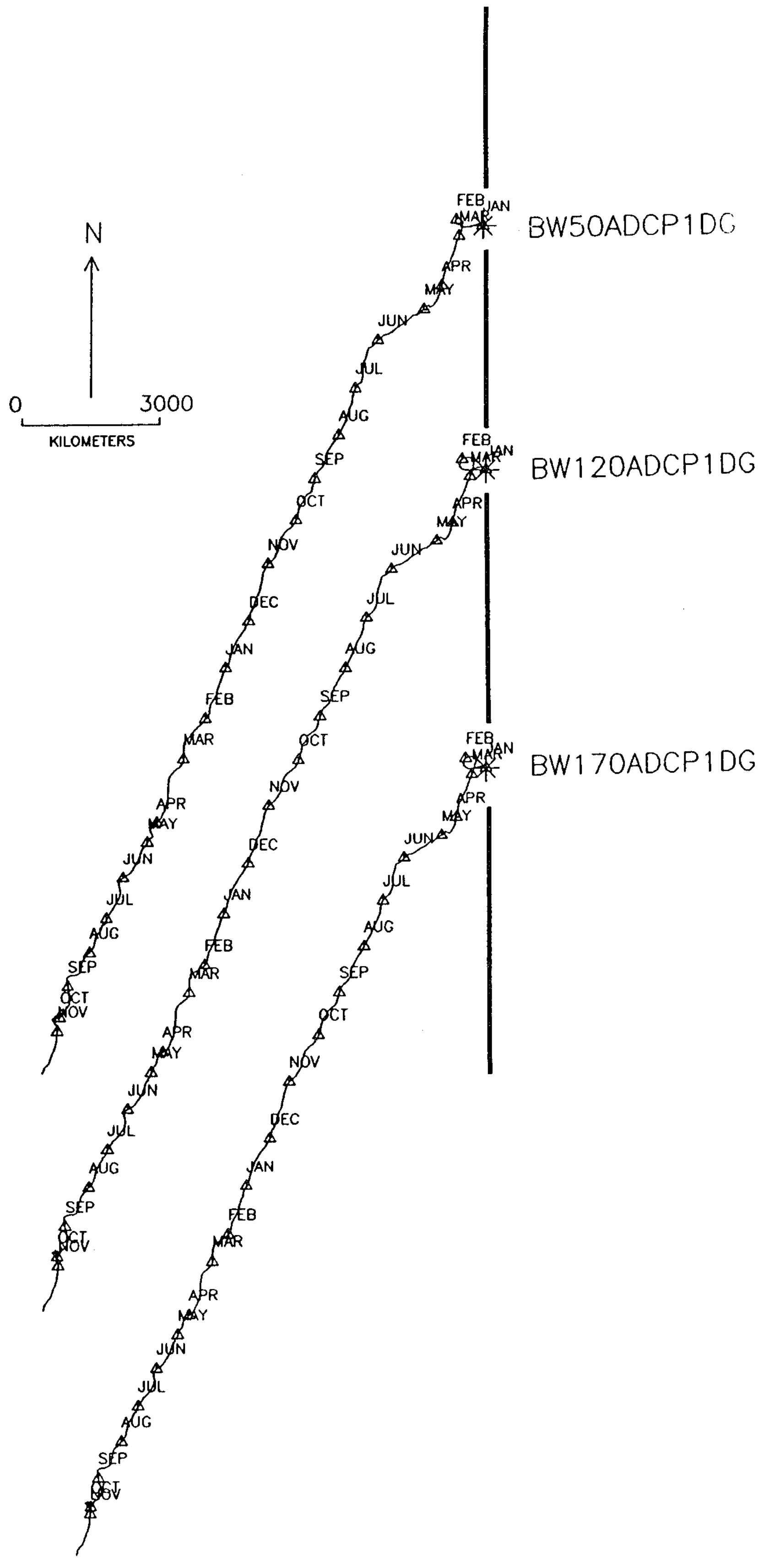

Mooring BW/333
ADCP vector depths of 50, 120, 170 m.
Temperature depth at 175 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
Temperature deg
23
21
19
17
15
13
N
20 cm/s



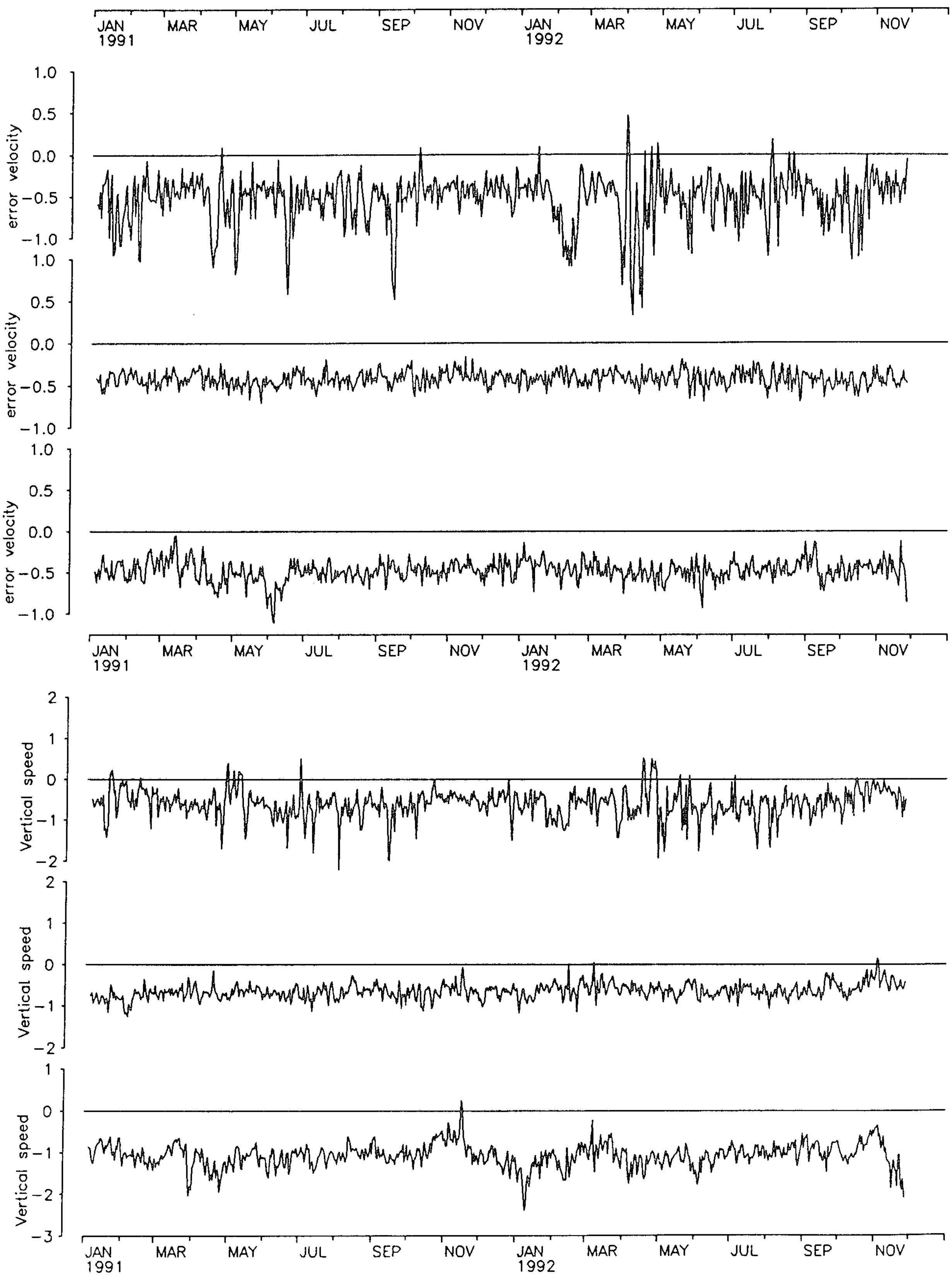
Mooring 333 * variables from an ADCP
instrument depth of 175 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
TEMP
HEADING
ROLL
PITCH

Mooring 333 * U and V components from an ADCP depths of 50, 120, 170 m.




N
0
3000
KILOMETERS
BW50ADCP1DG
BW120ADCP1DG
BW170ADCP1DG
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

Mooring 333 * W and E variables from an ADCP
depths of 50, 120, 170 m.



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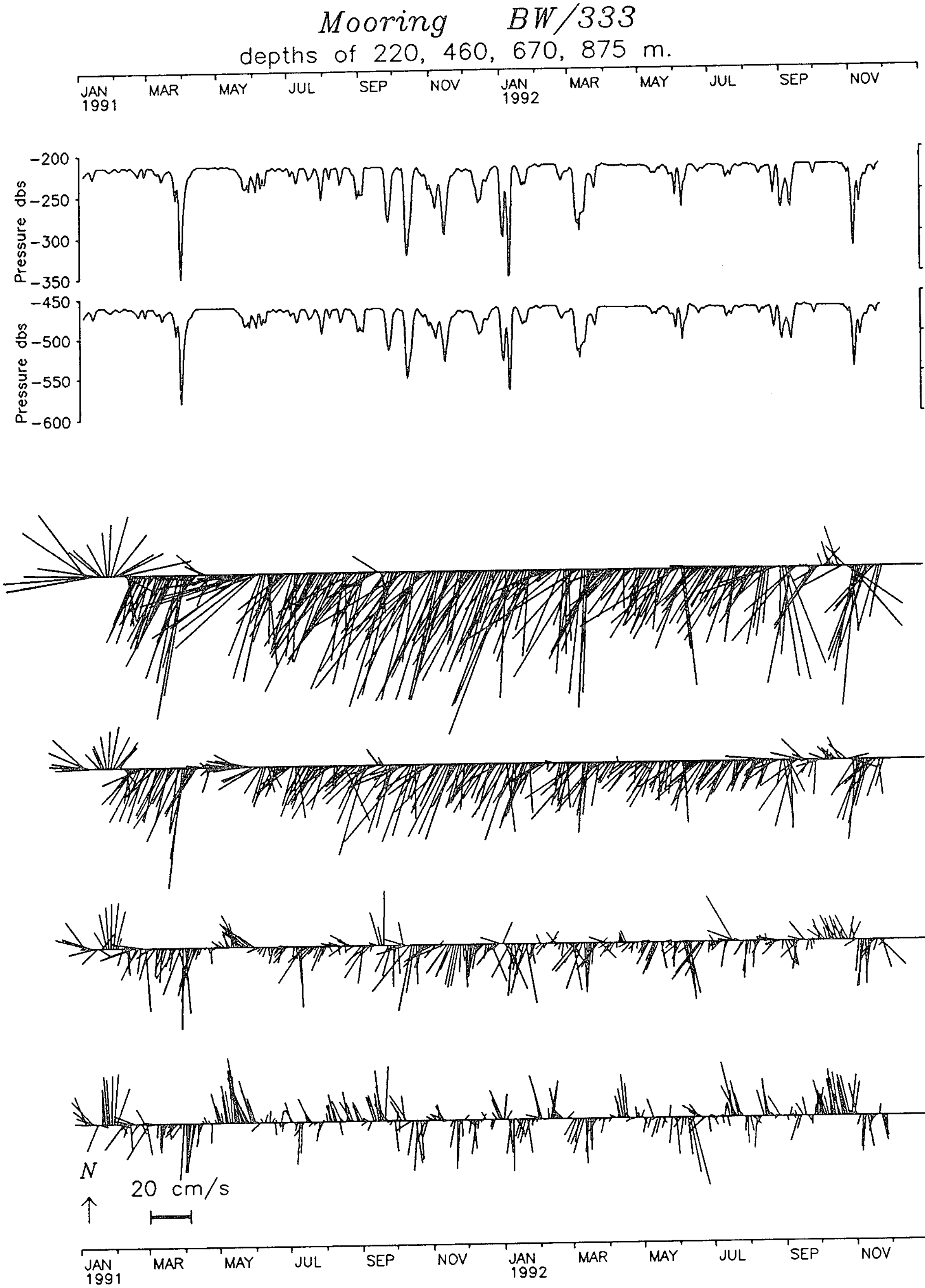
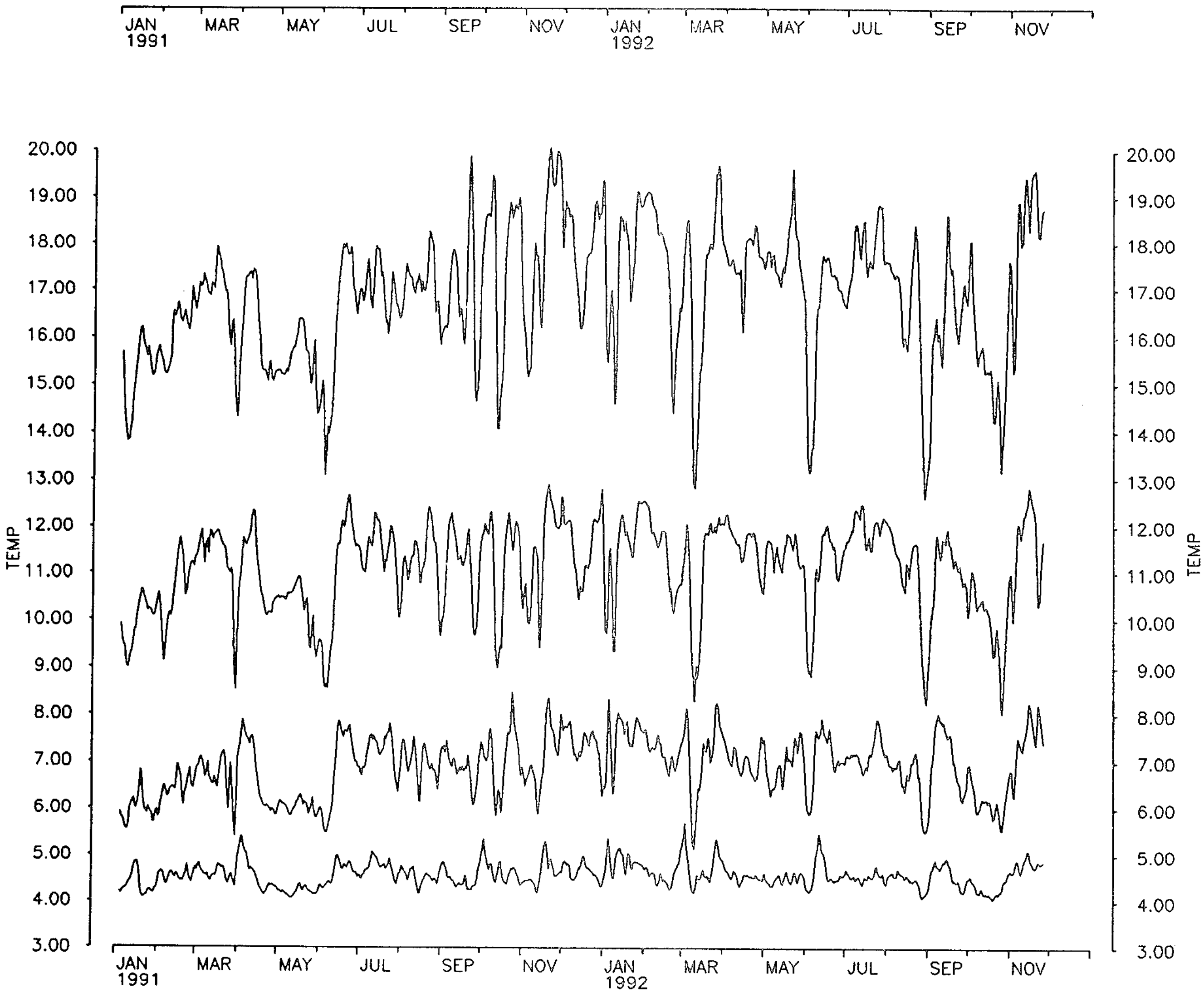
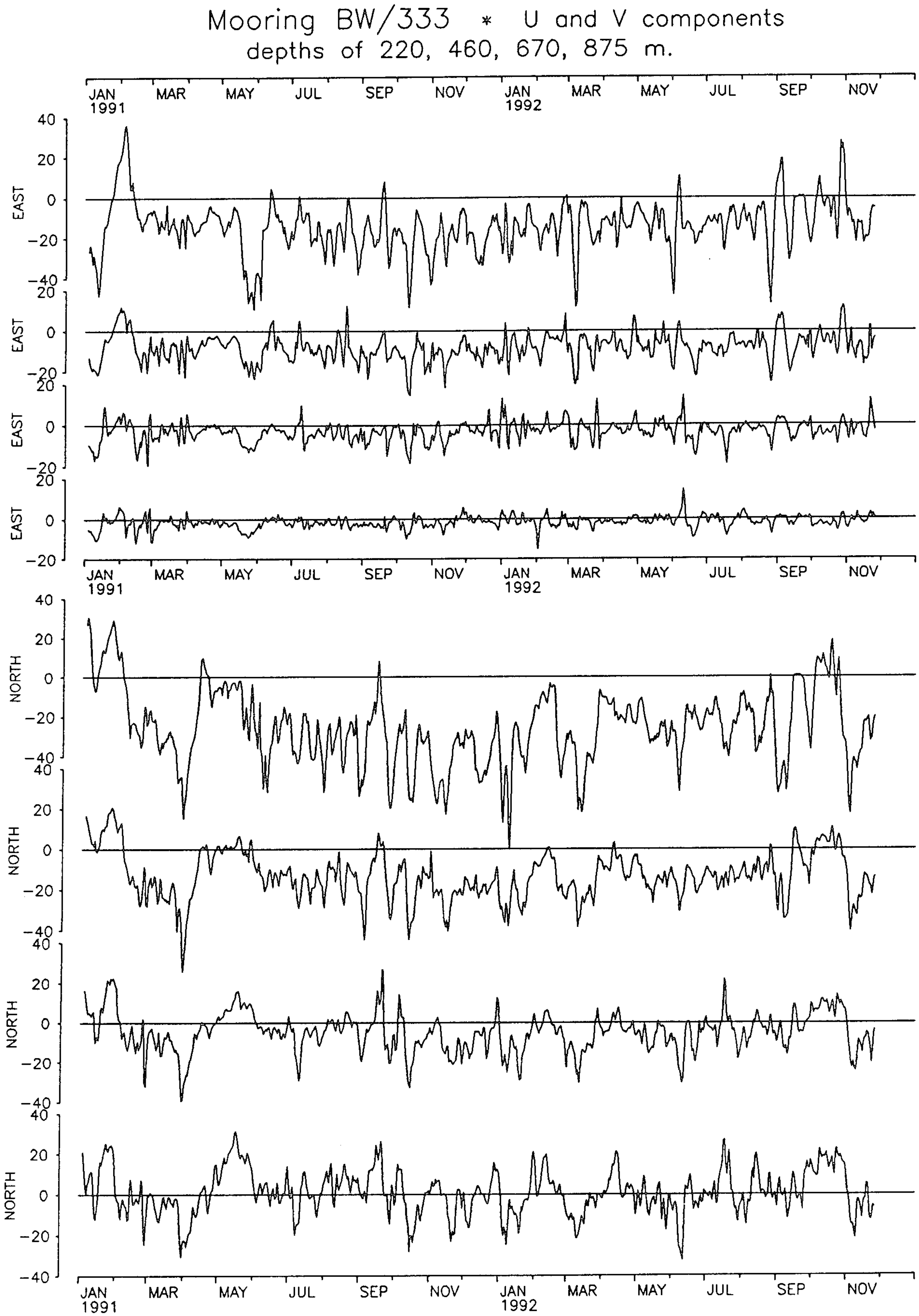
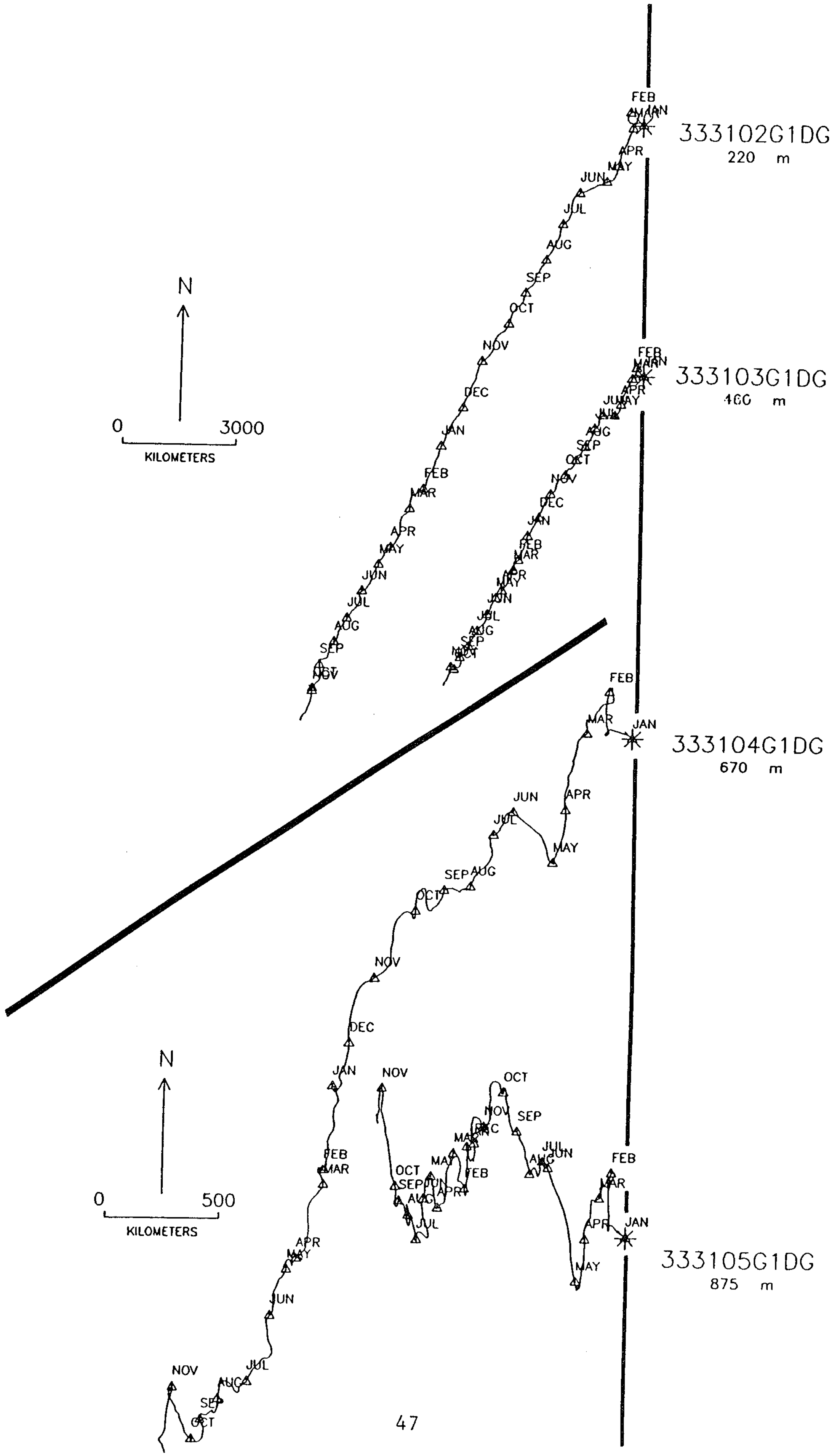

Mooring BW/333
depths of 220, 460, 670, 875 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
Pressure dbs
-200
-250
-300
-350
-450
-500
-550
-600
N
20 cm/s

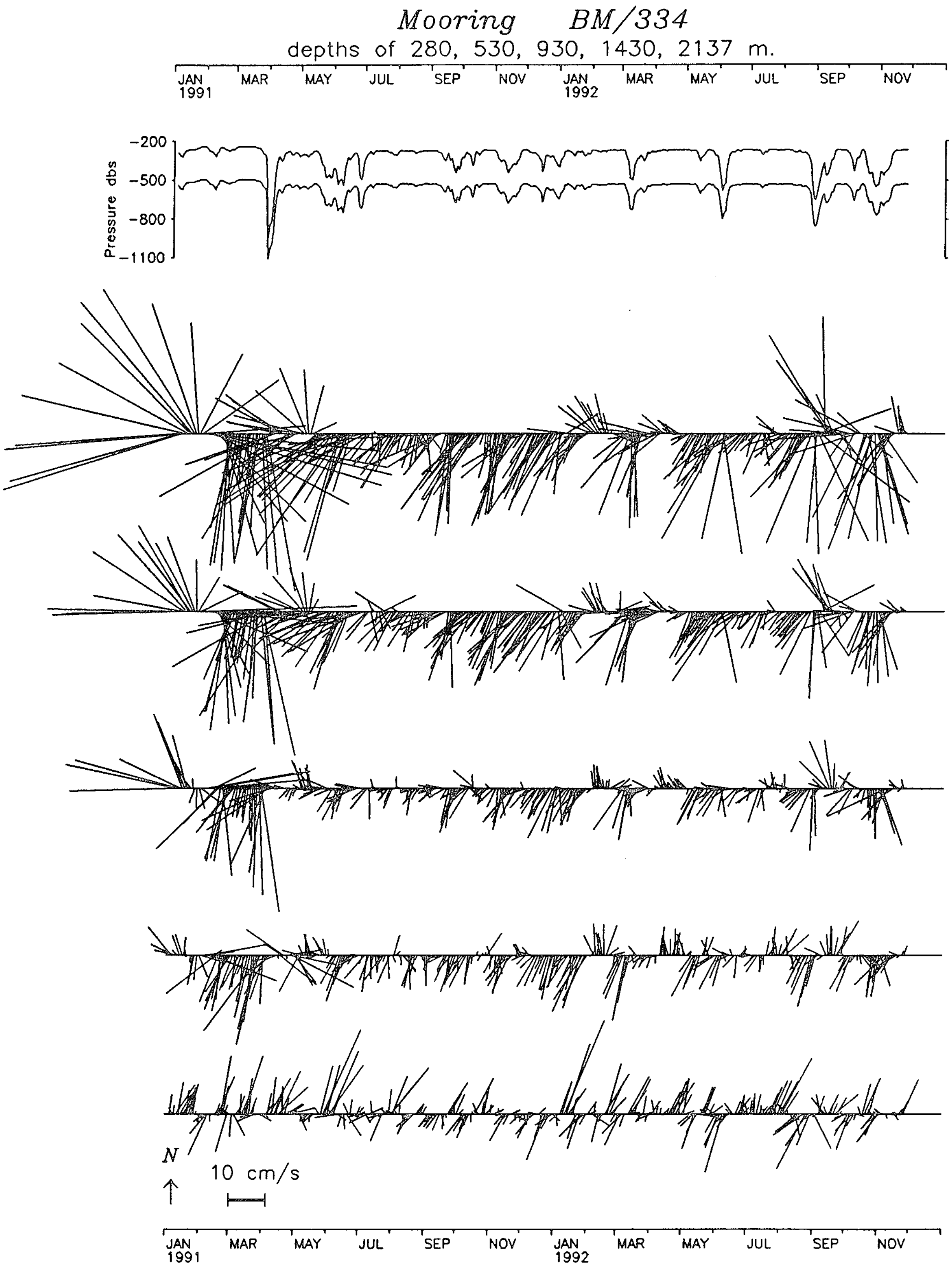
Mooring BW/333

* Temperatures at 220, 460, 670, and 875 meters

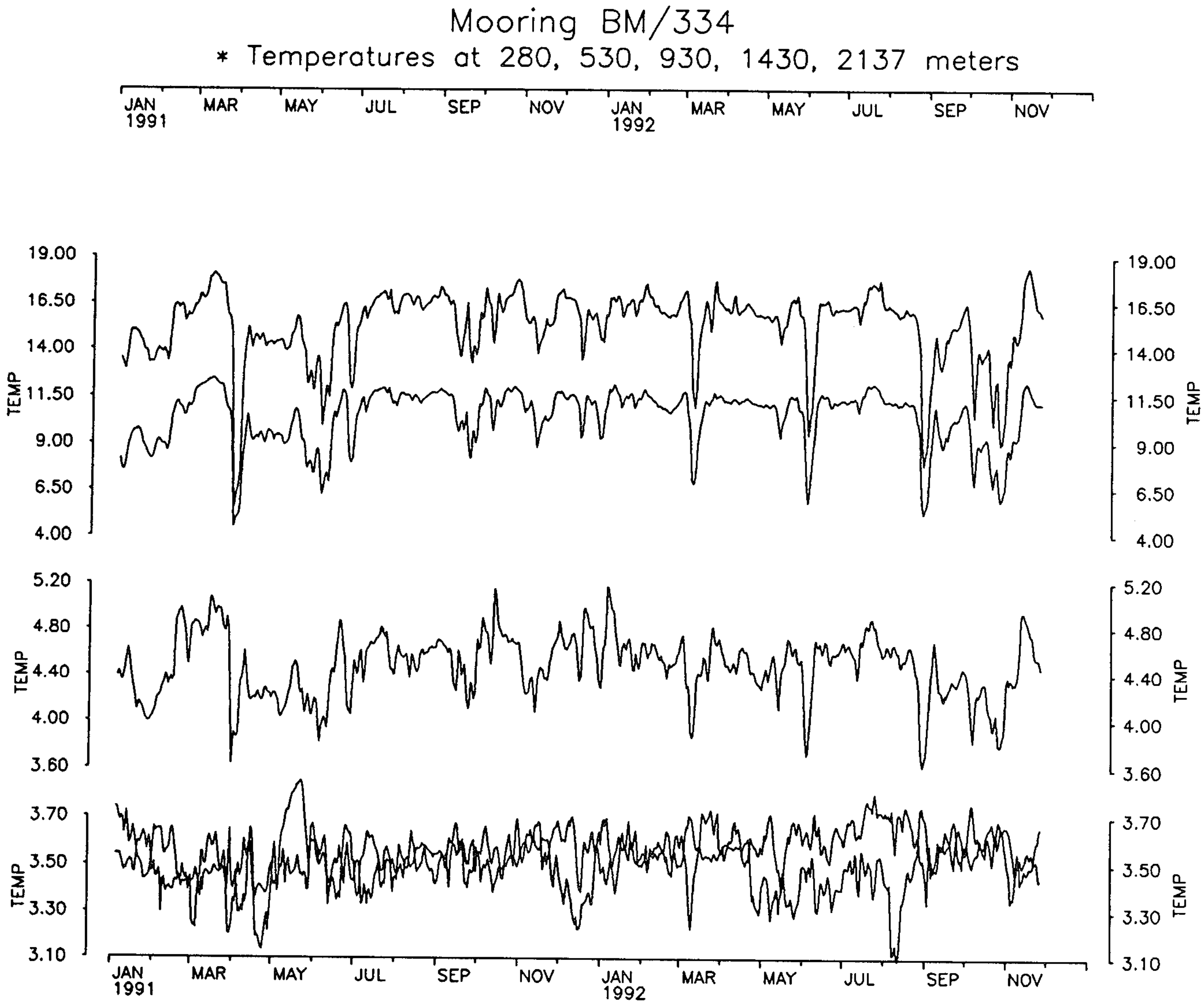



Mooring BW/333 * U and V components
depths of 220, 460, 670, 875 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
EAST
NORTH
40
20
0
-20
-40


333102G1DG
220 m
333103G1DG
460 m
333104G1DG
670 m
333105G1DG
875 m
N
0
3000
KILOMETERS
N
0
500
KILOMETERS

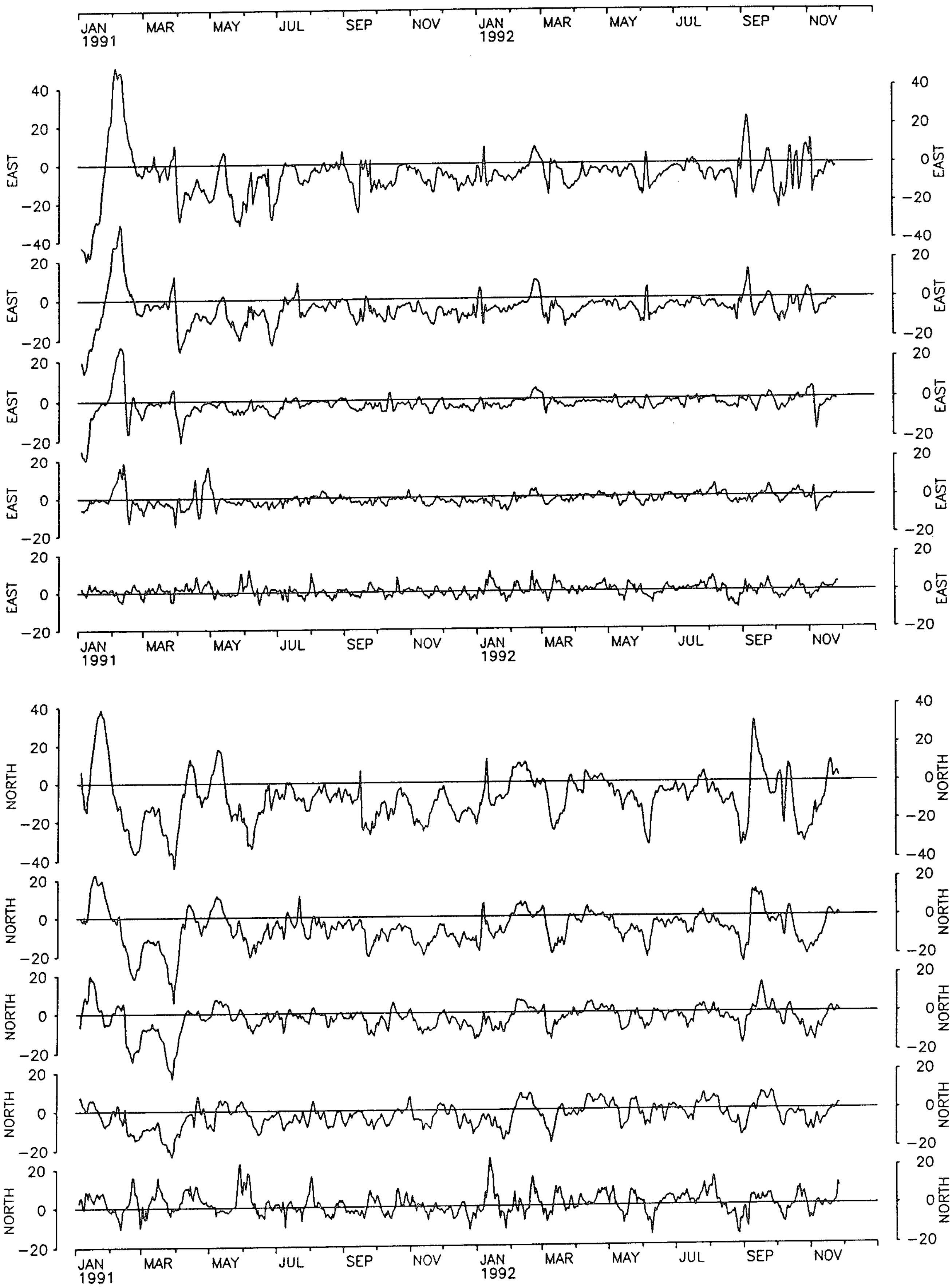


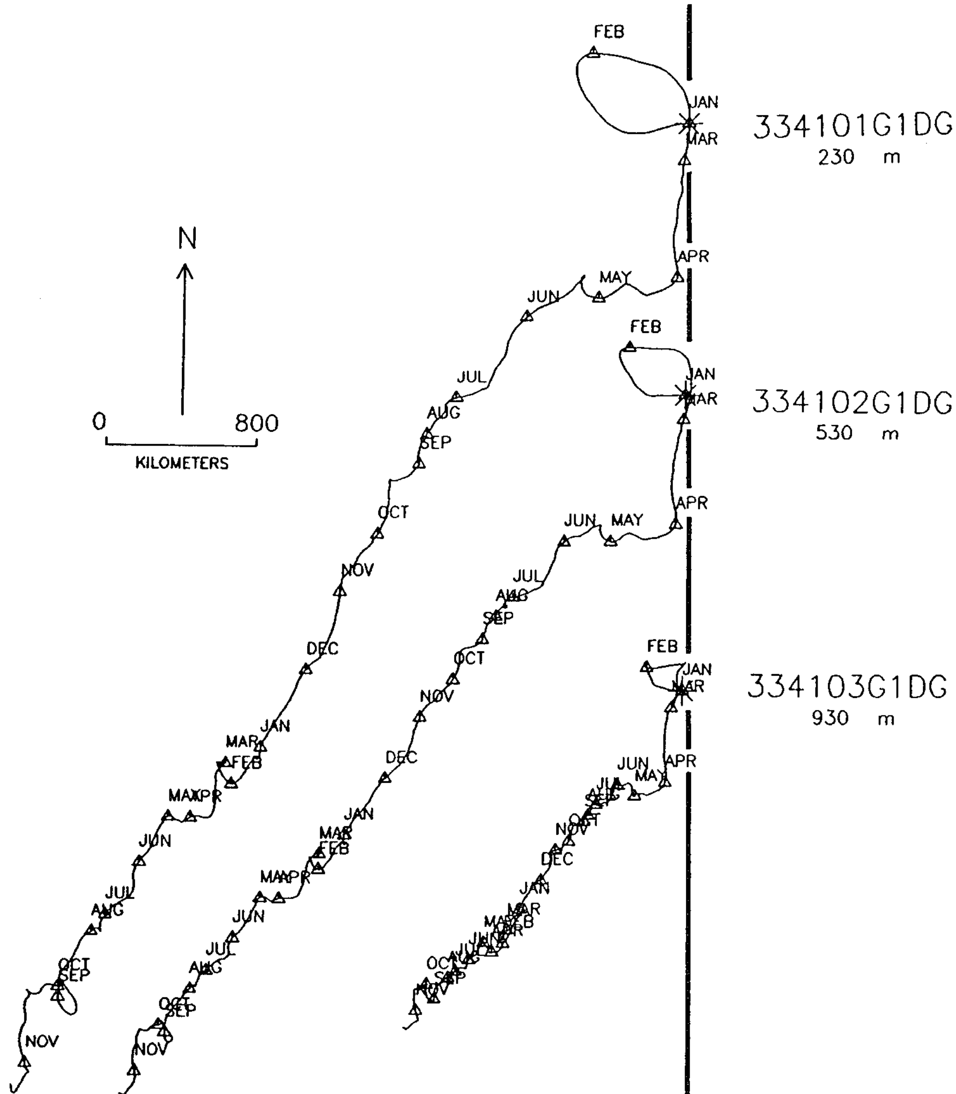
Mooring BM/334
depths of 280, 530, 930, 1430, 2137 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
Pressure dbs
-200
-500
-800
-1100
N
10 cm/s



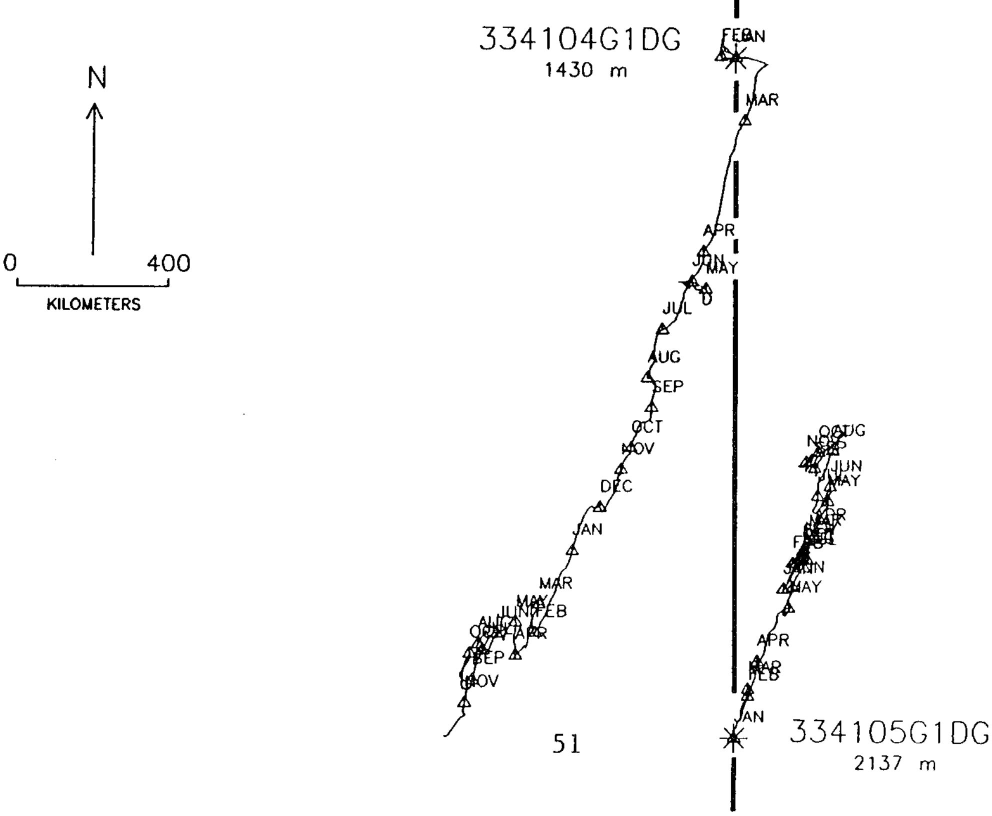
Mooring BM/334
* Temperatures at 280, 530, 930, 1430, 2137 meters
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
TEMP
19.00
16.50
14.00
11.50
9.00
6.50
4.00
5.20
4.80
4.40
4.00
3.60
3.70
3.50
3.30
3.10

Mooring BM/334 * U and V components
depths of 280, 530, 930, 1430, 2137 M.





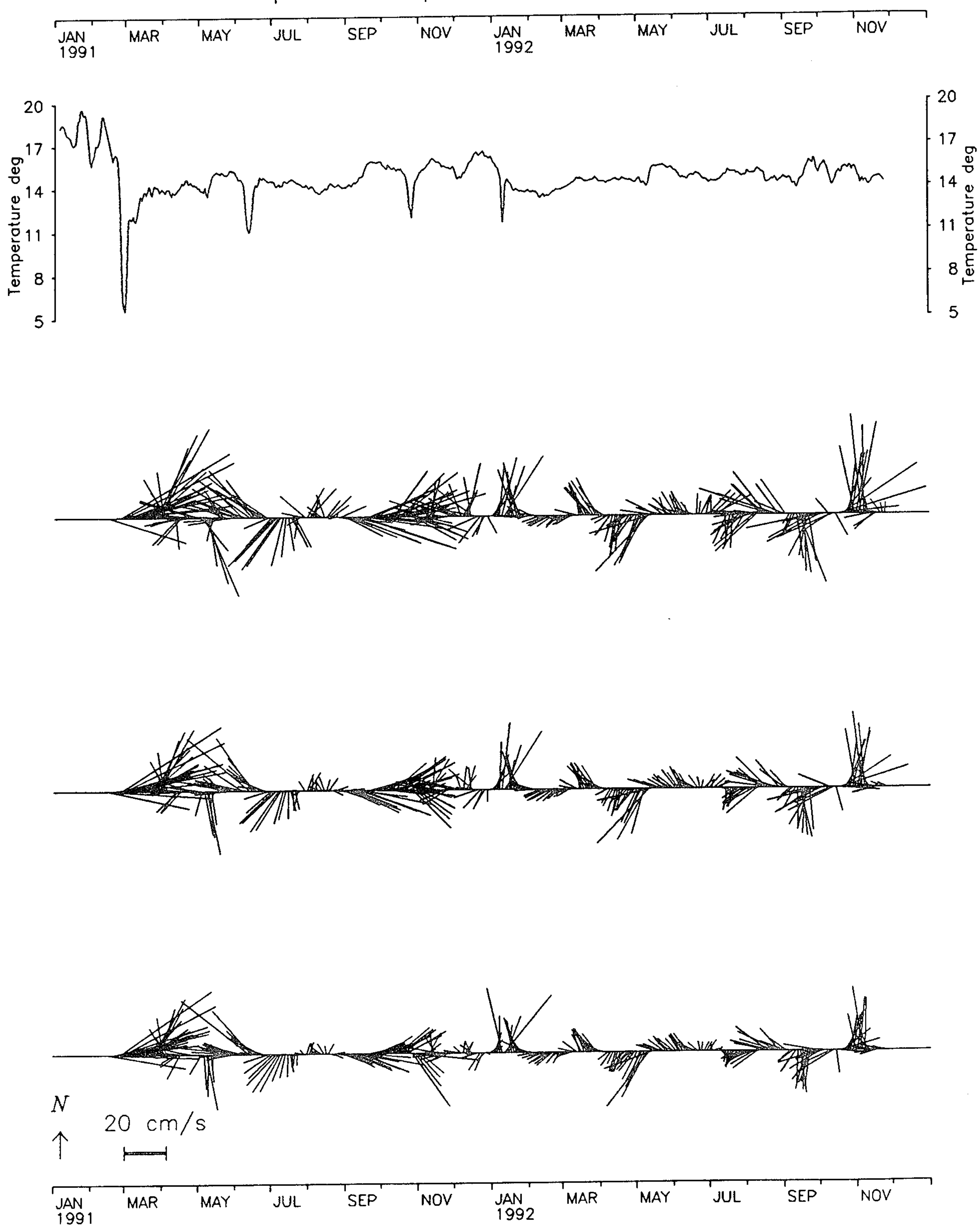
334101G1DG
230 m
334102G1DG
530 m
334103G1DG
930 m
N
0 800
KILOMETERS

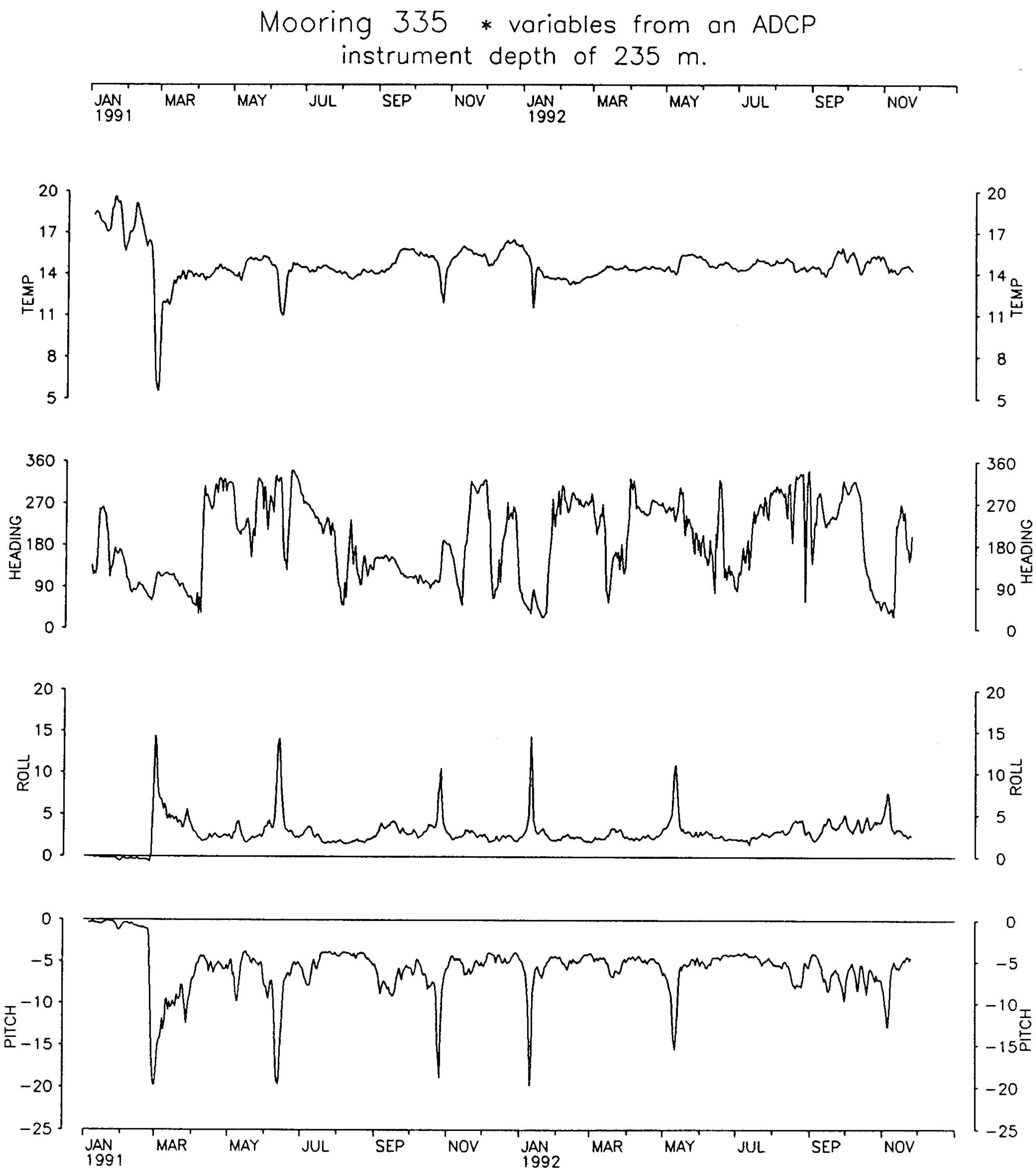


334104G1DG
1430 m
334105G1DG
2137 m
N
0 400
KILOMETERS

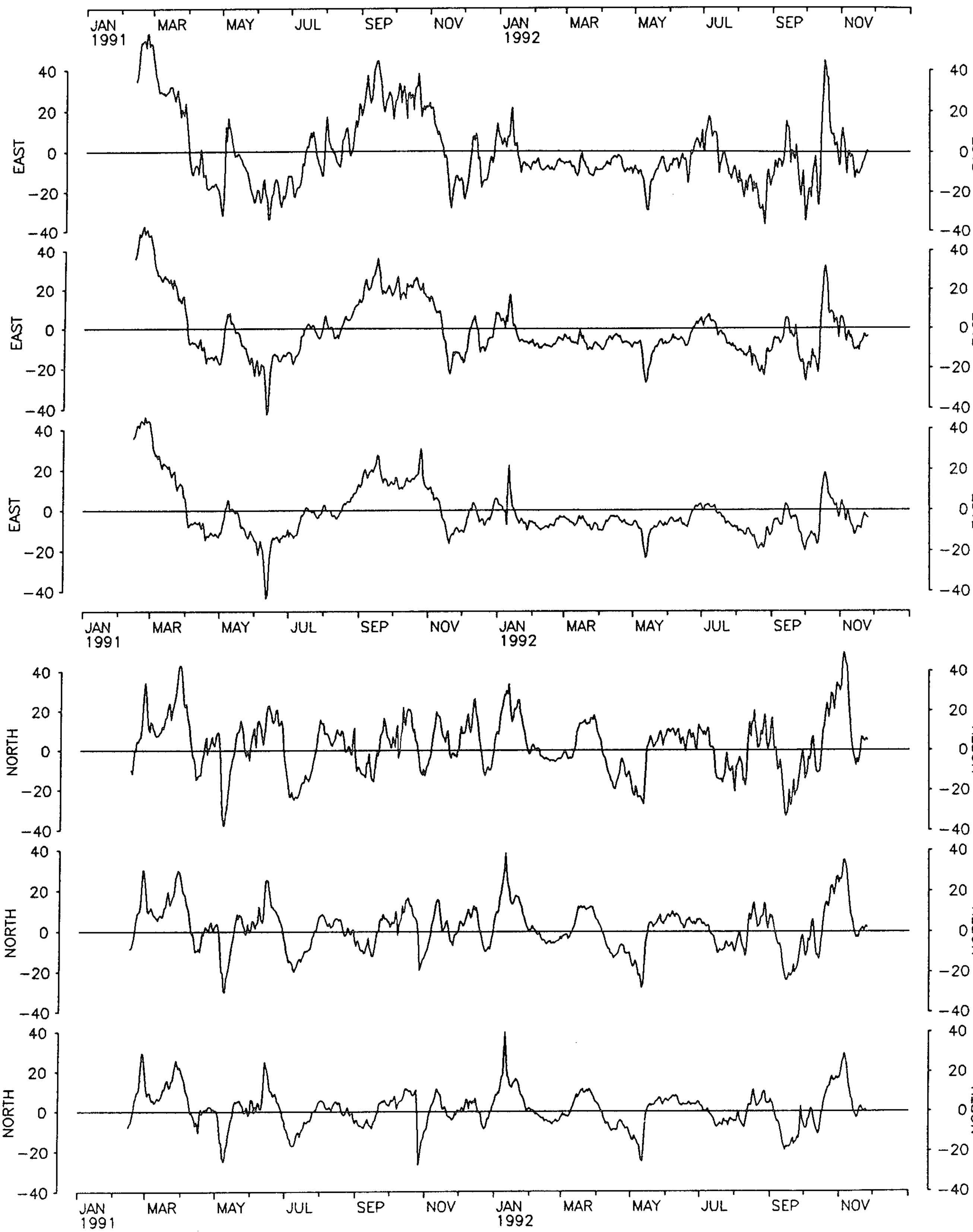
Mooring BE/335

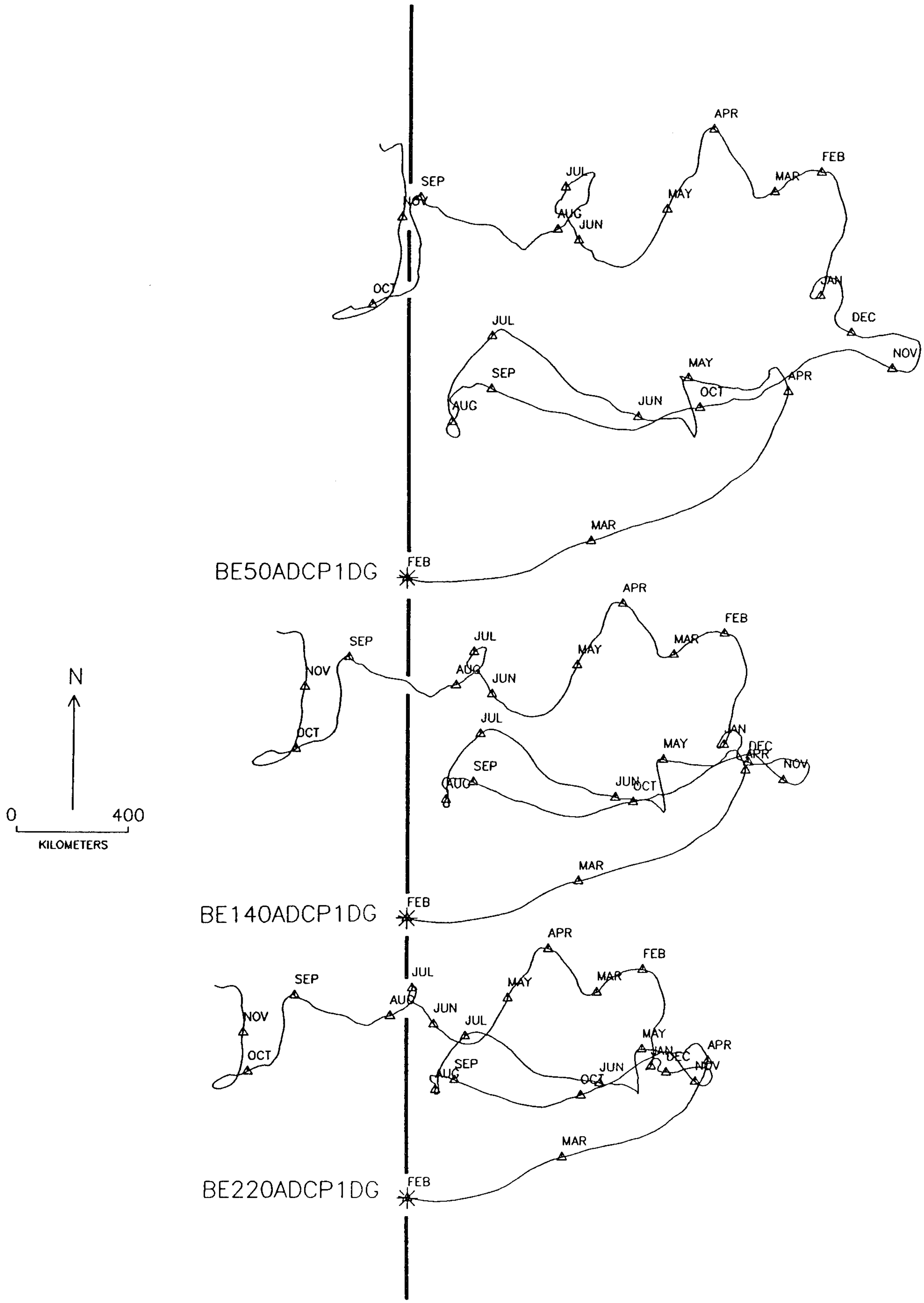
ADCP vector depths of 50, 140, 220 m.
Temperature depth at 235 m.

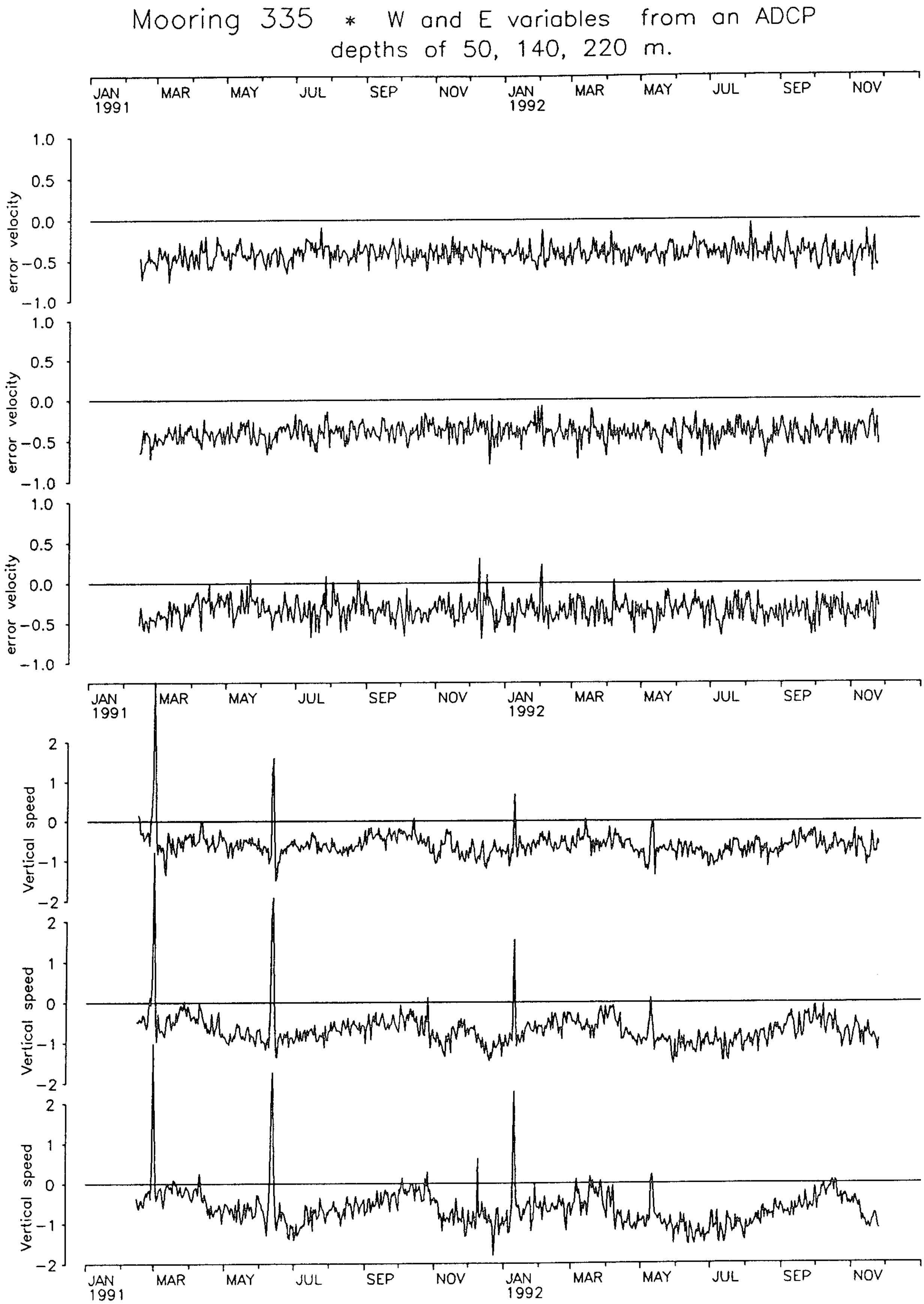



Mooring 335 * variables from an ADCP
instrument depth of 235 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
TEMP
HEADING
ROLL
PITCH

Mooring 335 * U and V components from an ADCP
depths of 50, 140, 220 m.




BE50ADCP1DG
BE140ADCP1DG
BE220ADCP1DG
N
0
400
KILOMETERS
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
JAN



Mooring 335 * W and E variables from an ADCP
depths of 50, 140, 220 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
error velocity
Vertical speed

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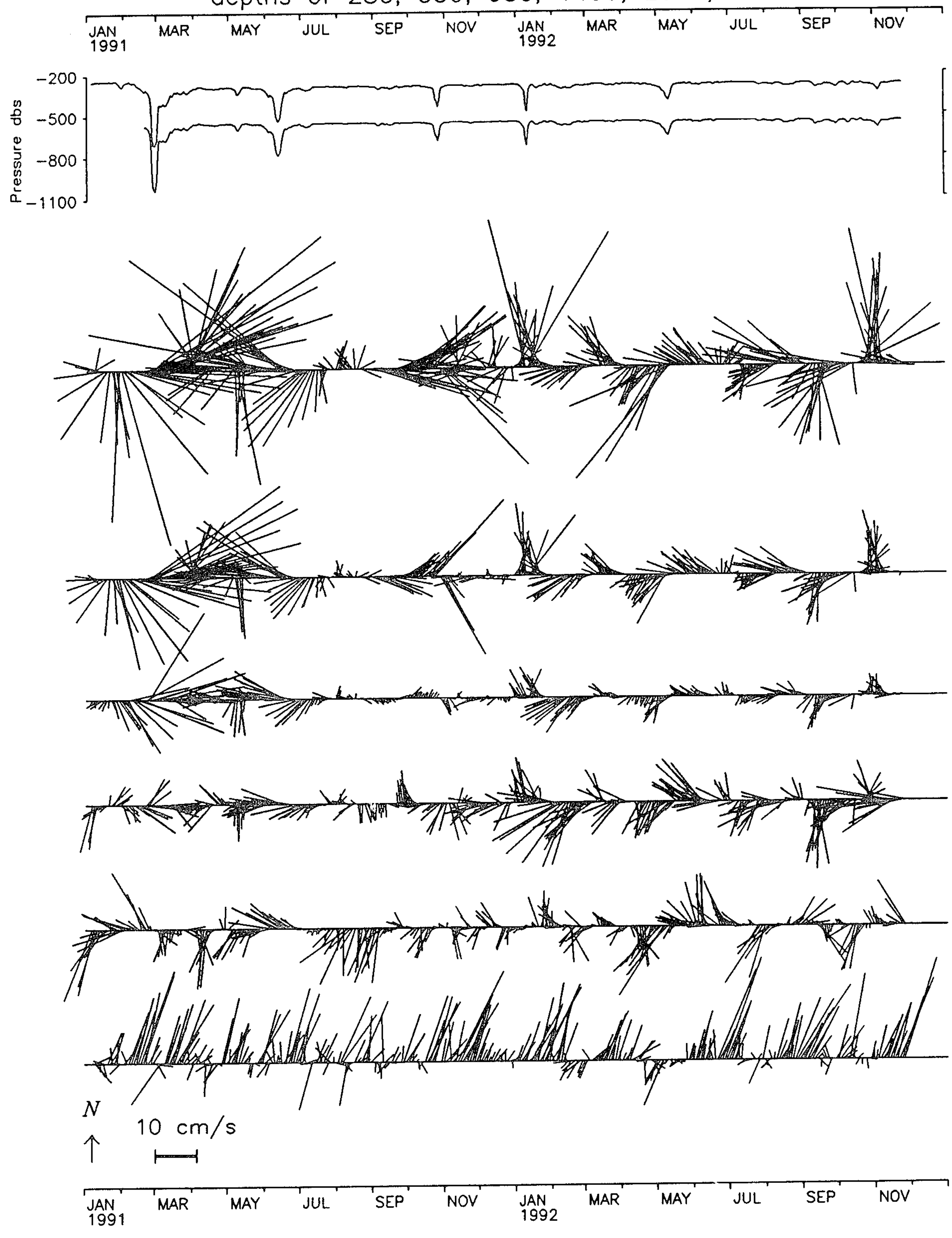
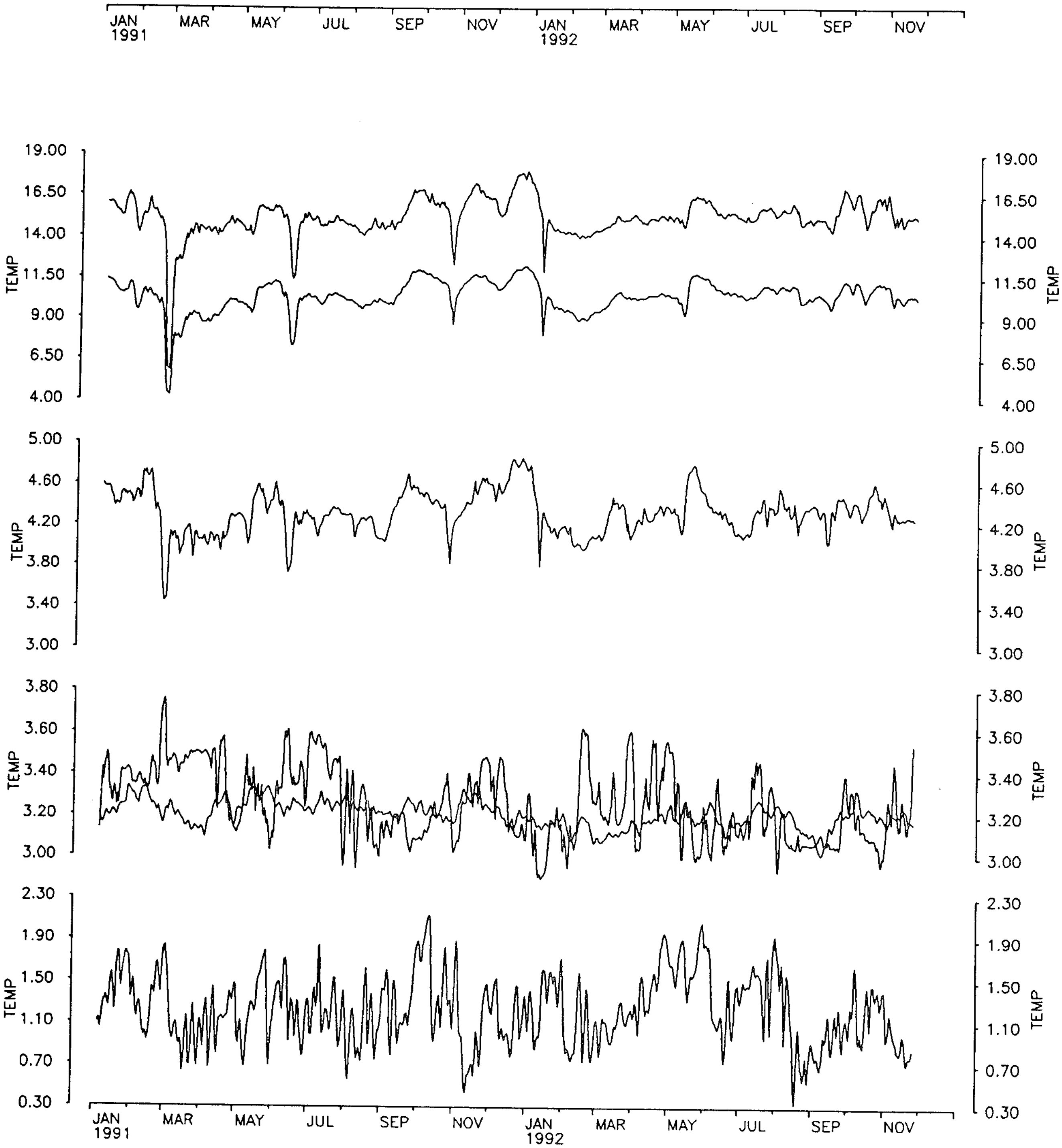
Mooring BE/335

depths of 280, 550, 950, 1450, 2545, 3208 m.

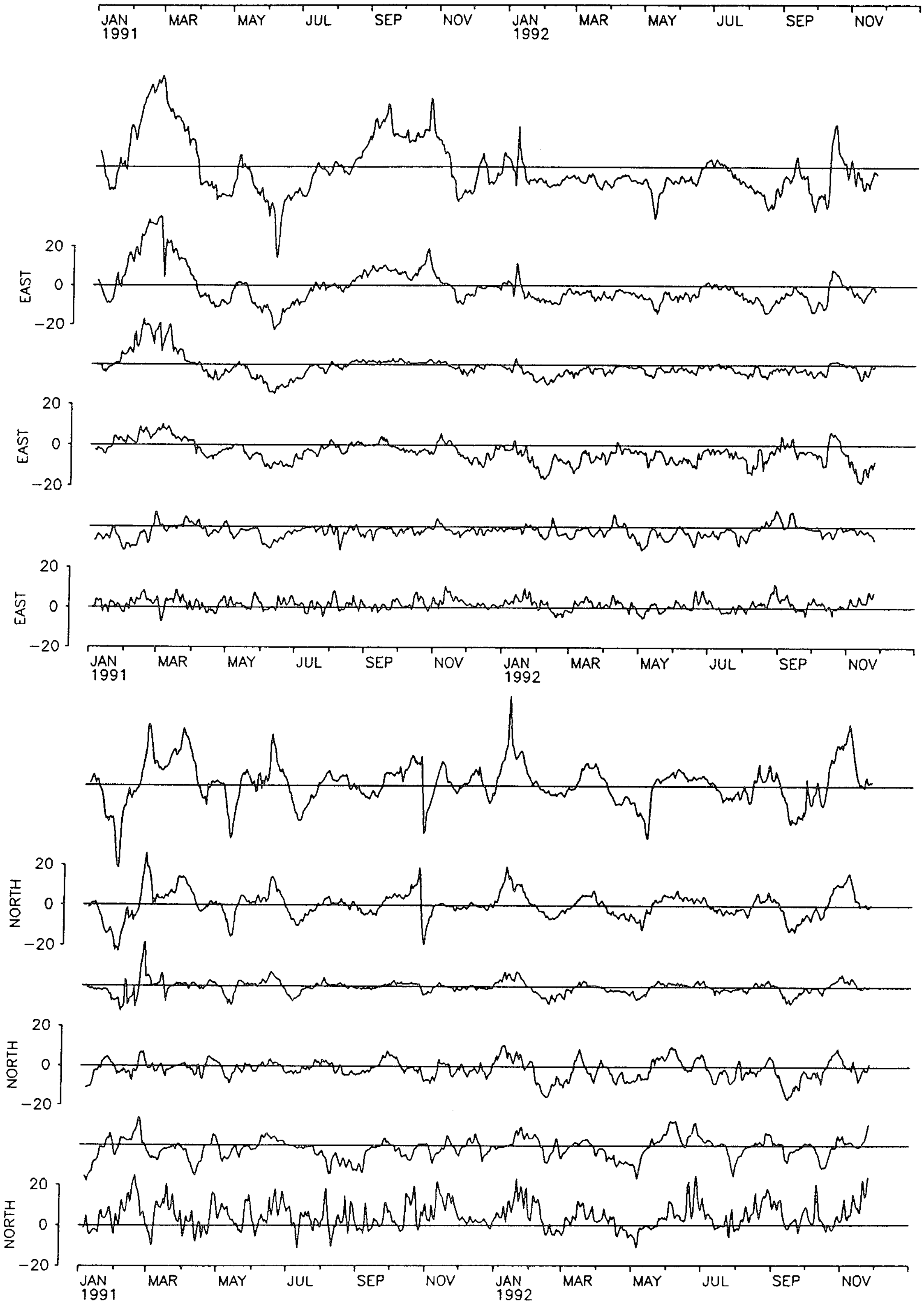


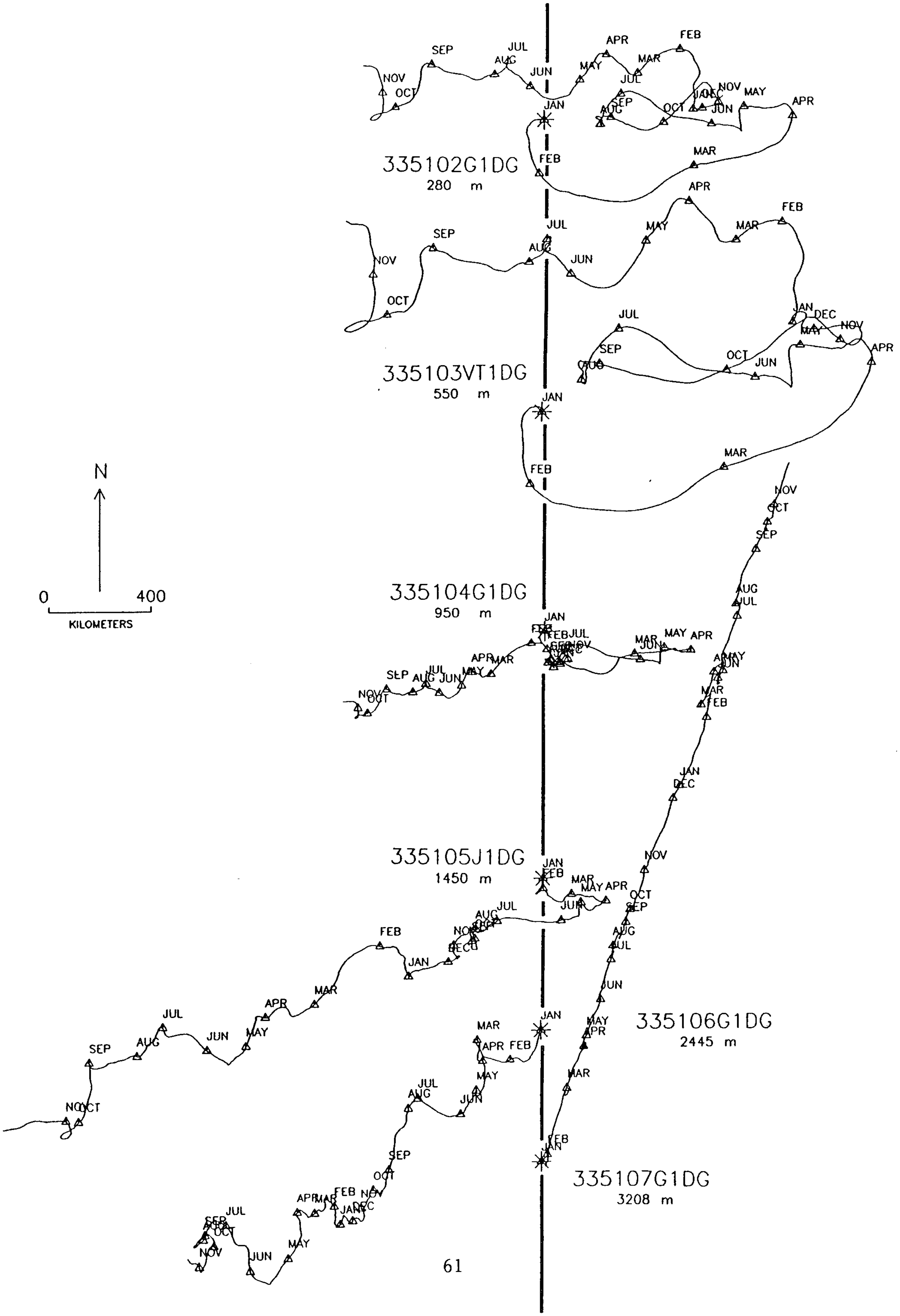
Mooring BE/335

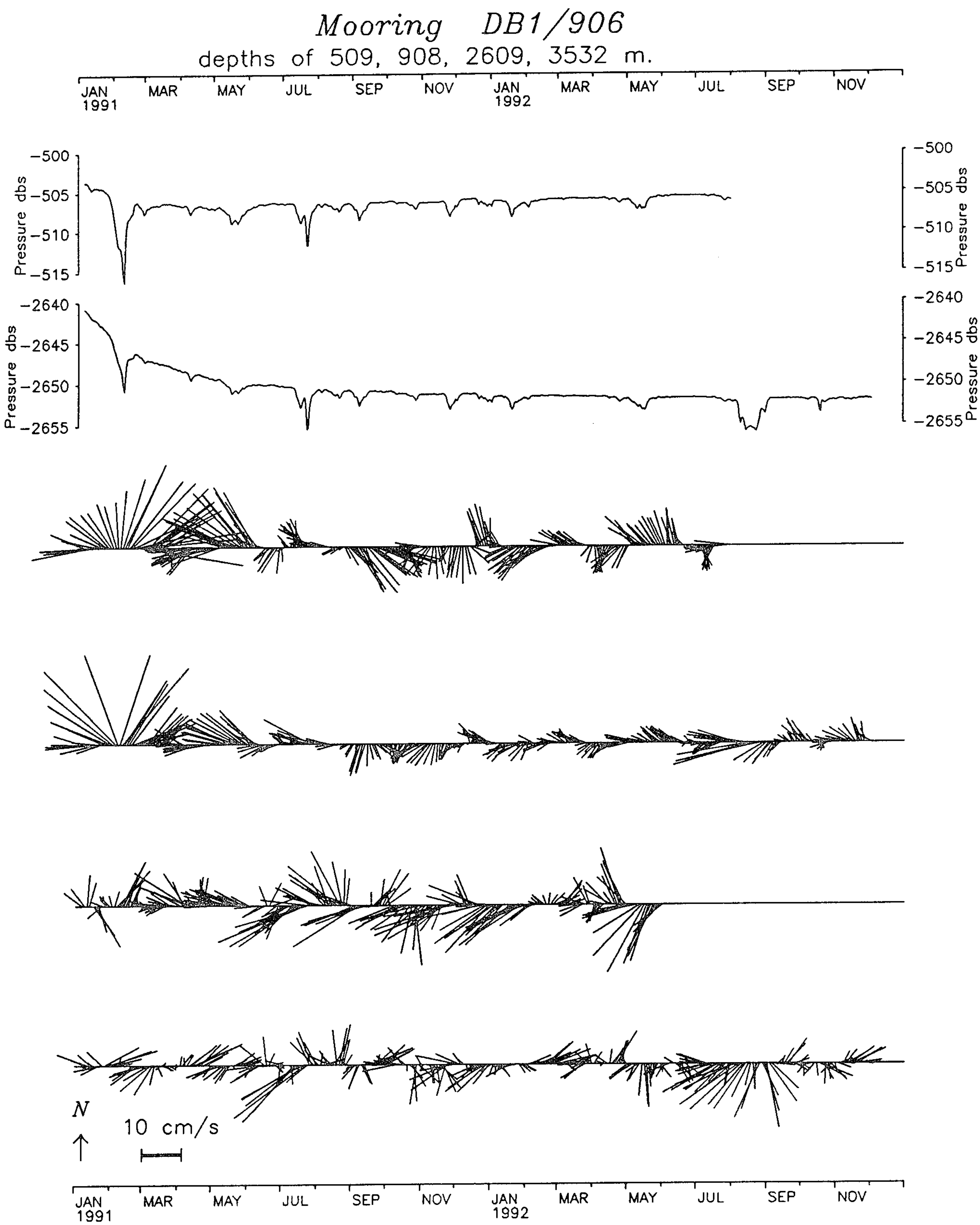
* Temperatures at 280, 550, 950, 1450, 2545, 3208 meters



Mooring BE/335 * U and V components
depths of 280, 550, 950, 1450, 2545, 3208 M.

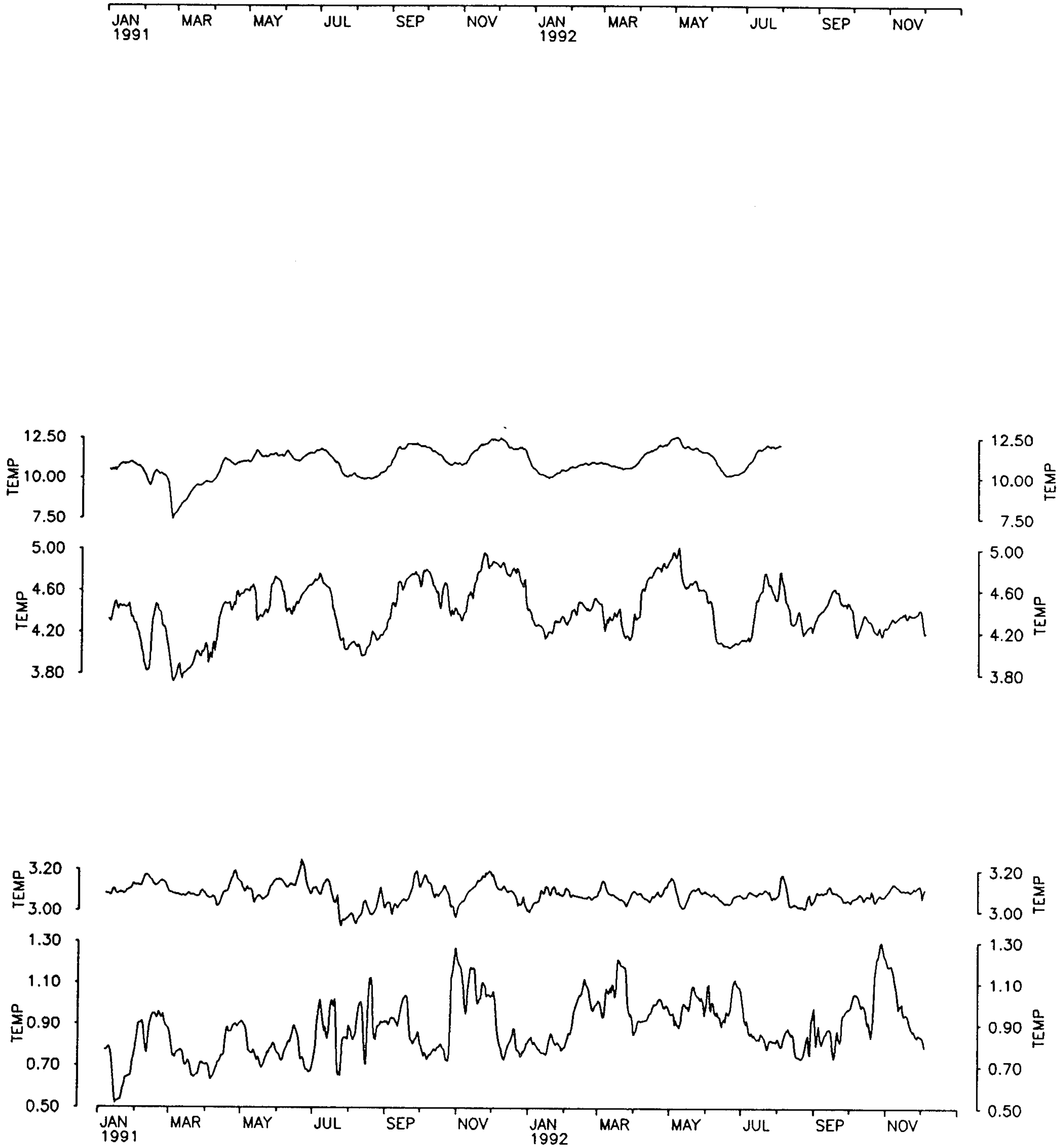



335102G1DG
280 m
335103VT1DG
550 m
335104G1DG
950 m
335105J1DG
1450 m
335106G1DG
2445 m
335107G1DG
3208 m
N
0
400
KILOMETERS

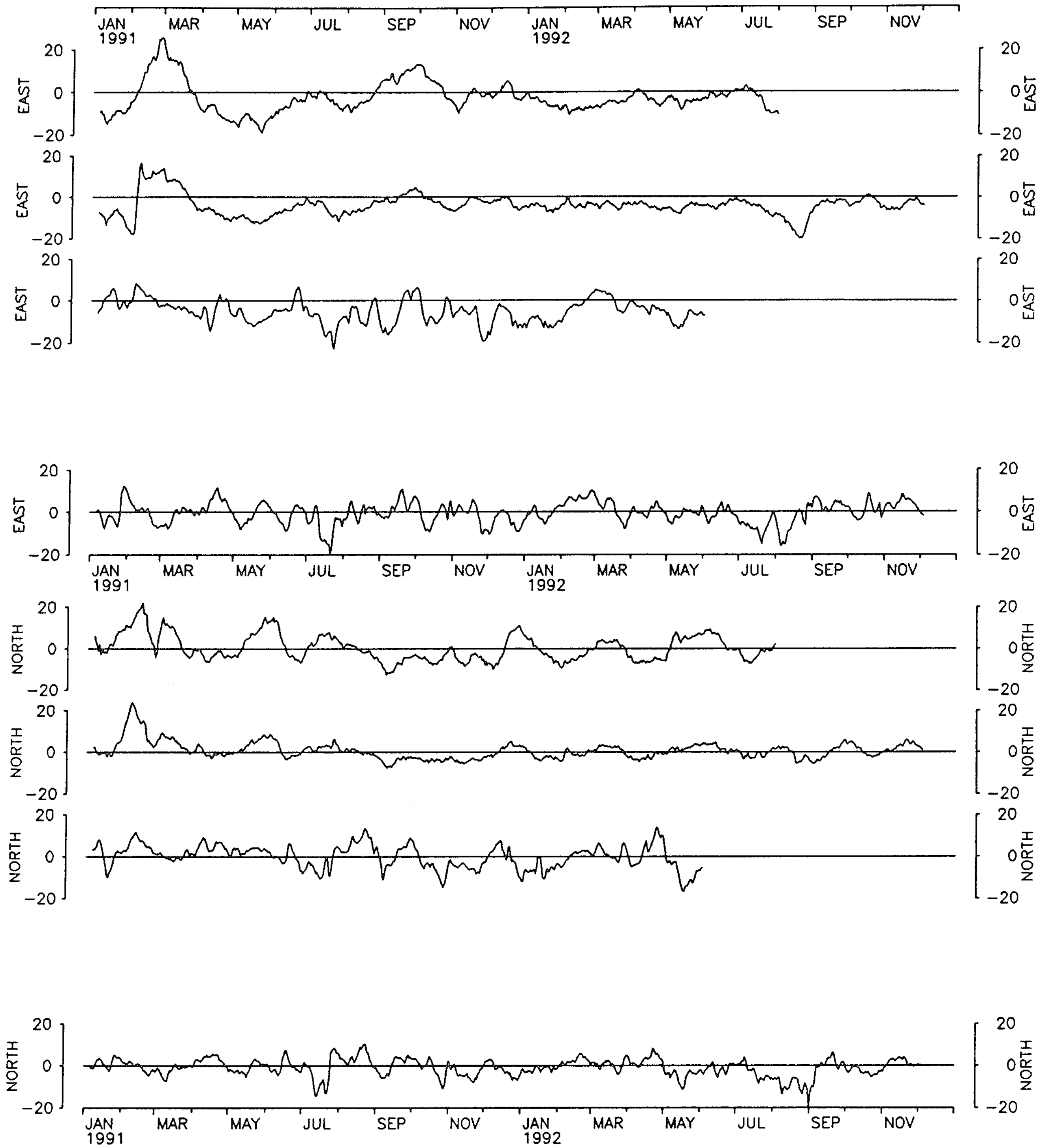

Mooring DB1/906
depths of 509, 908, 2609, 3532 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
Pressure dbs
-500
-505
-510
-515
-2640
-2645
-2650
-2655
N
10 cm/s

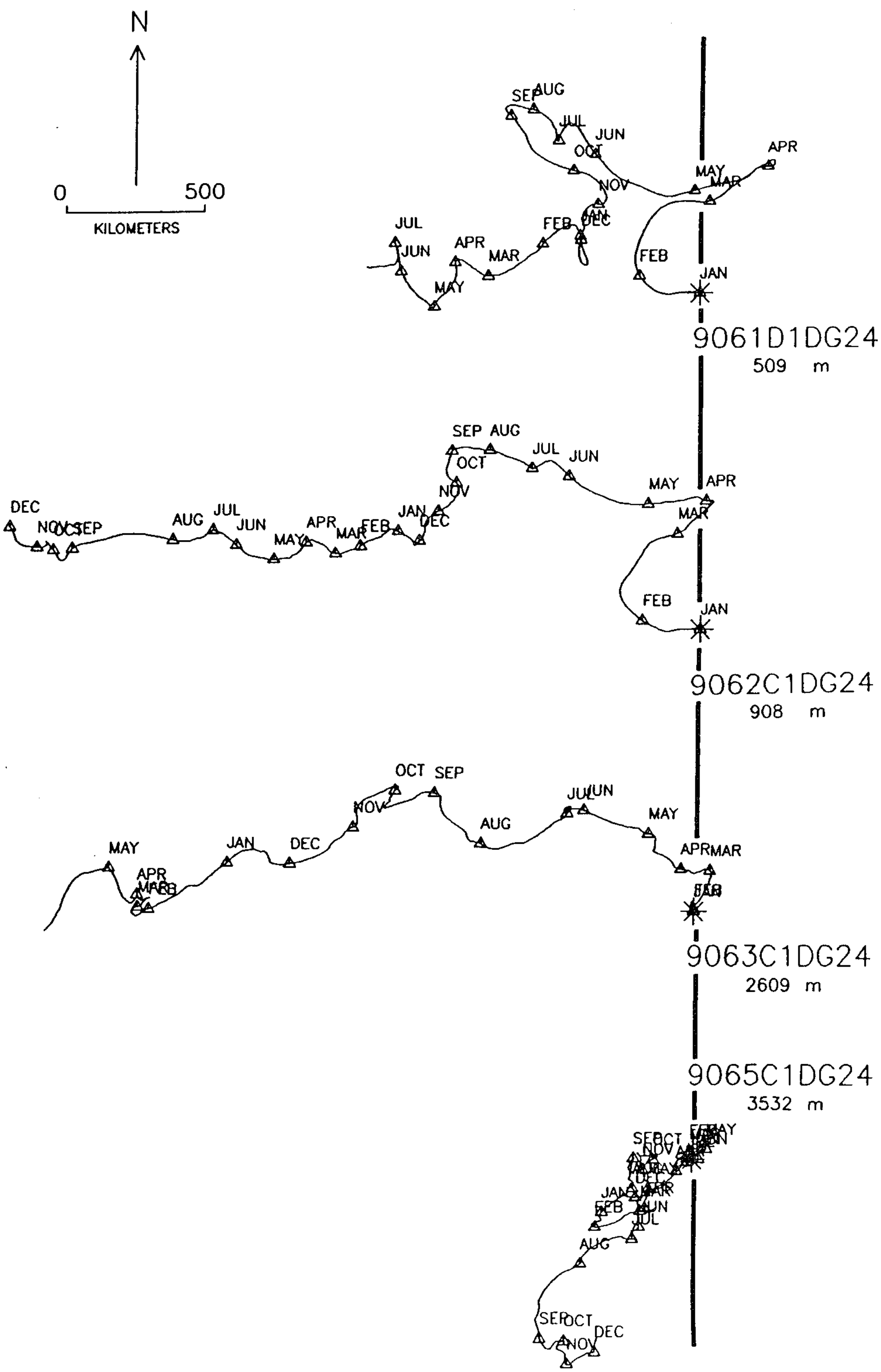
Mooring DB1/906

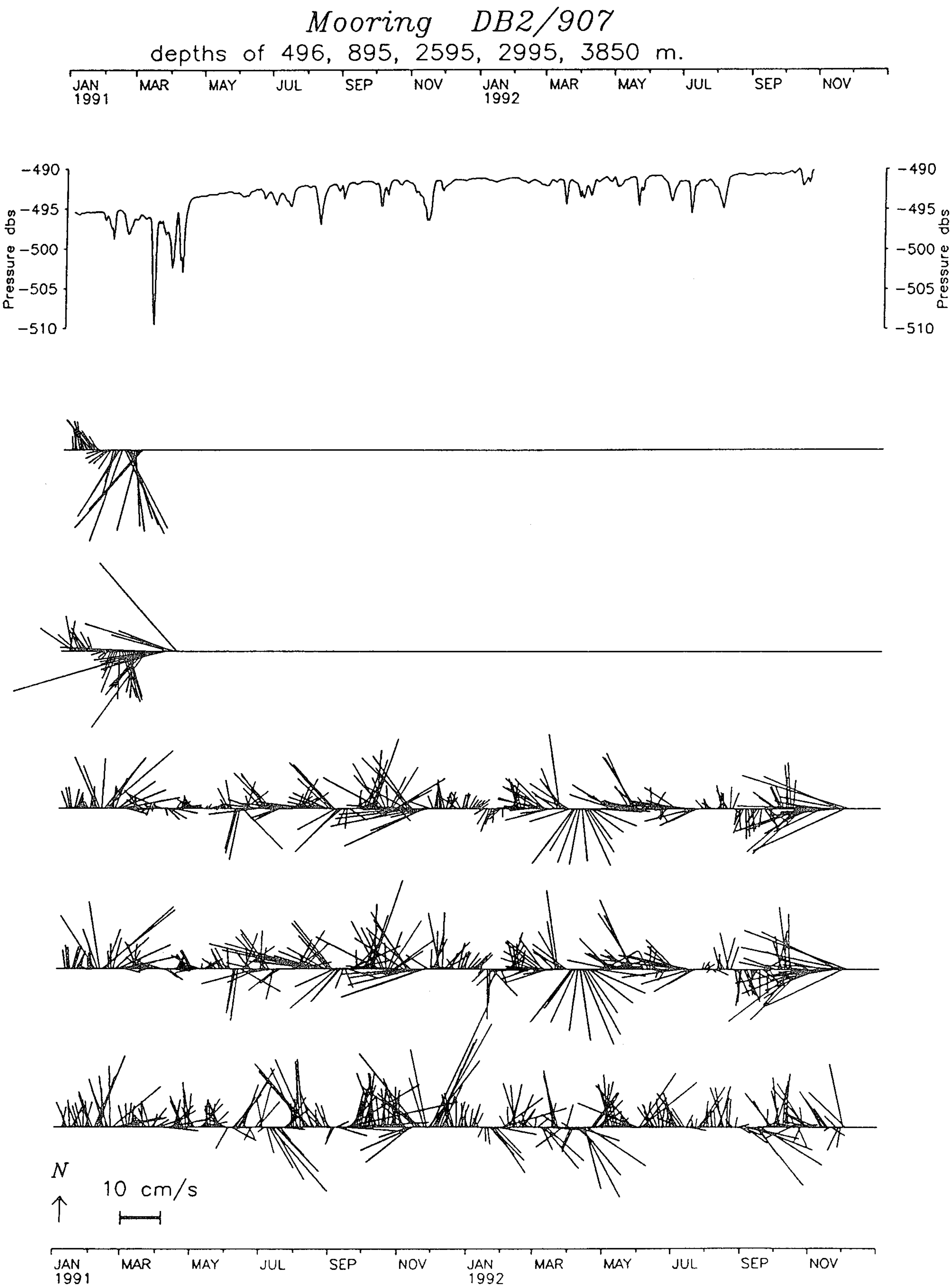
* Temperatures at 509, 908, 2609, 3532 M.

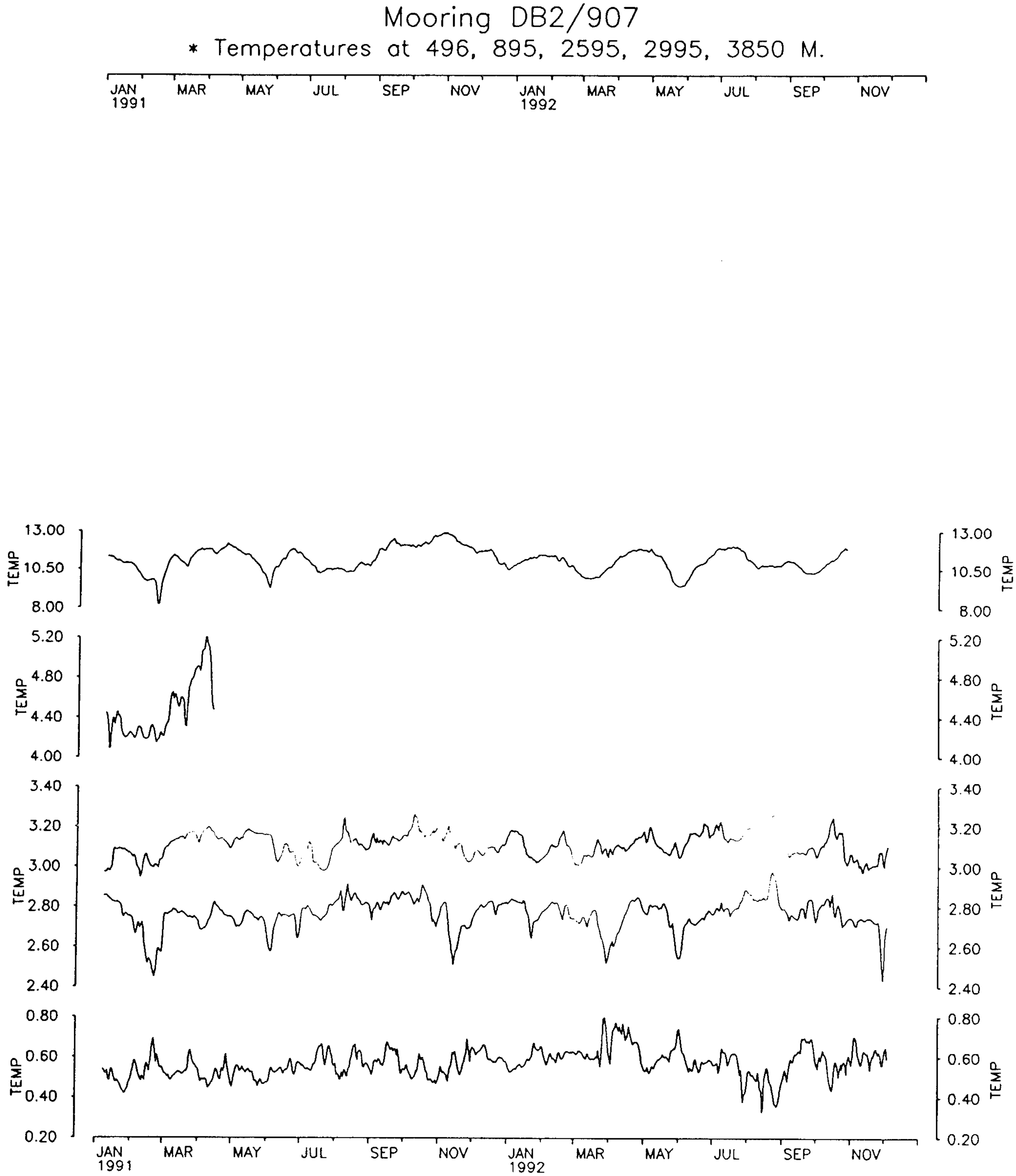


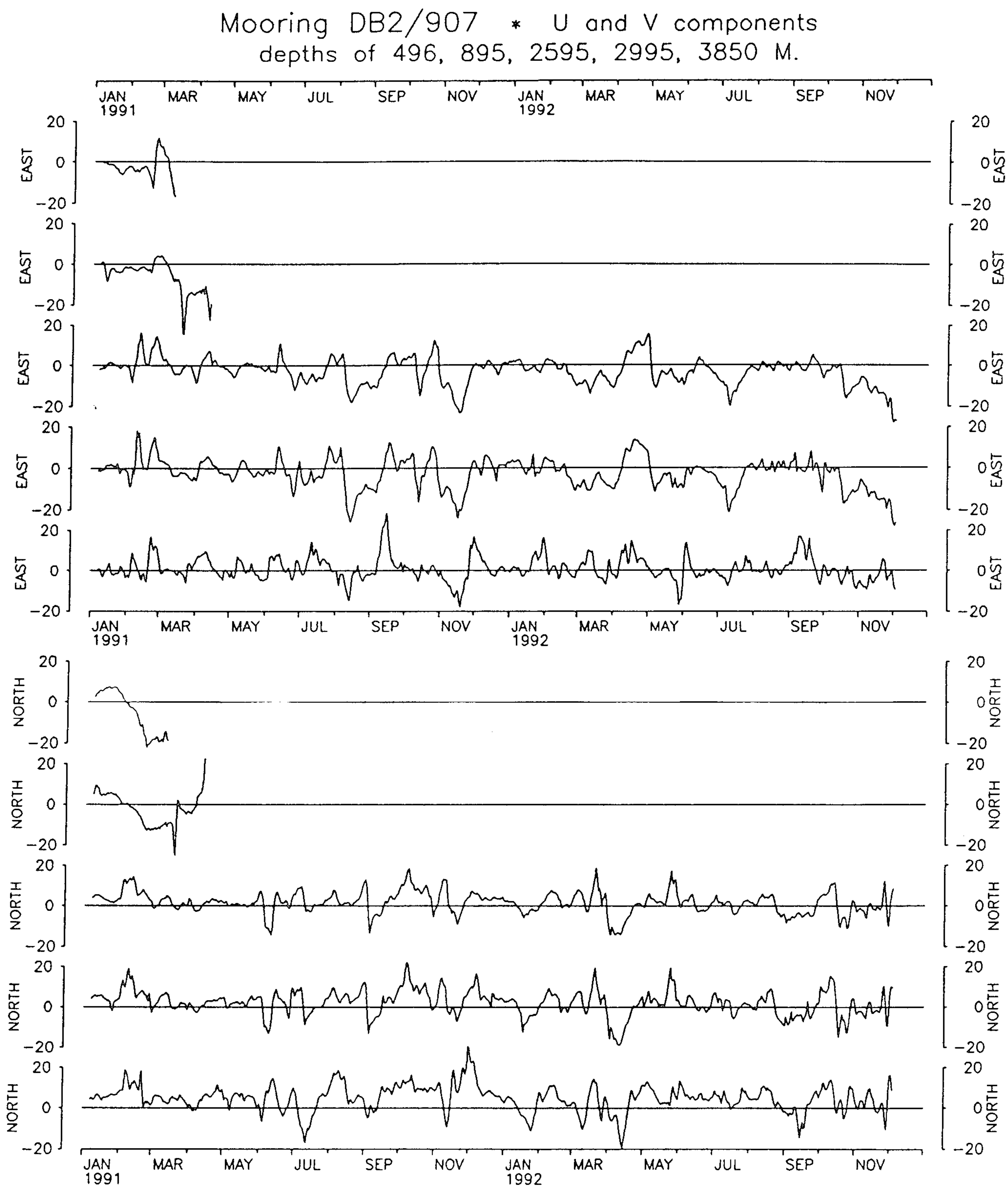
Mooring DB1/906 * U and V components
depths of 509, 908, 2609, 3532 m.

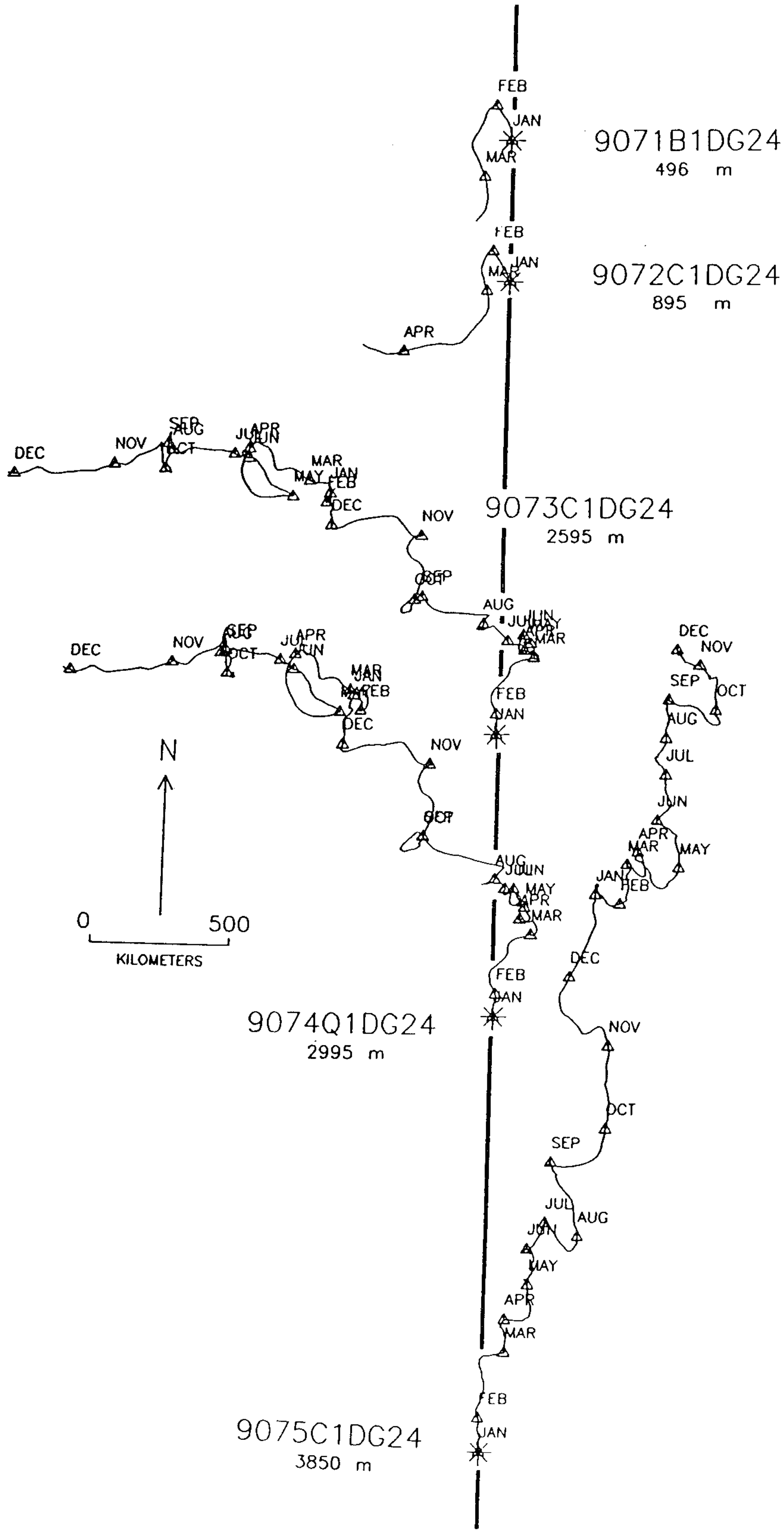



N
0
500
KILOMETERS
9061D1DG24
509 m
9062C1DG24
908 m
9063C1DG24
2609 m
9065C1DG24
3532 m


Mooring DB2/907
depths of 496, 895, 2595, 2995, 3850 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
Pressure dbs
-490
-495
-500
-505
-510
N
10 cm/s

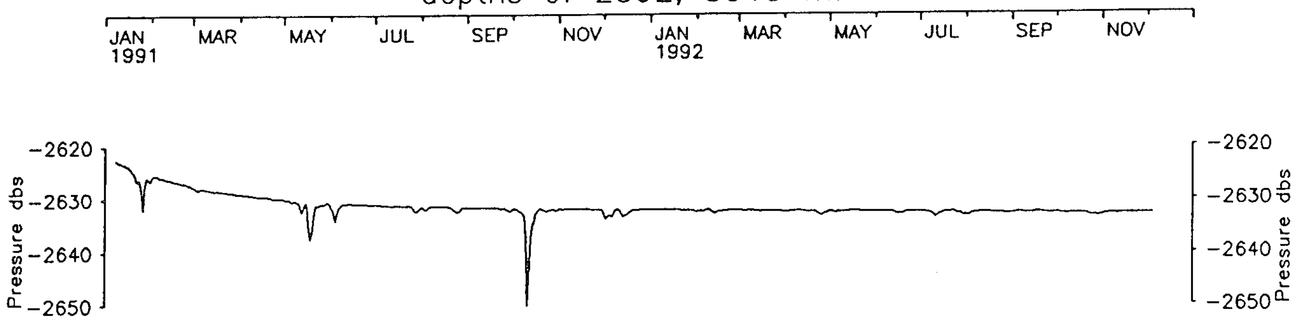

Mooring DB2/907
* Temperatures at 496, 895, 2595, 2995, 3850 M.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
TEMP
13.00
10.50
8.00
5.20
4.80
4.40
4.00
3.40
3.20
3.00
2.80
2.60
2.40
0.80
0.60
0.40
0.20

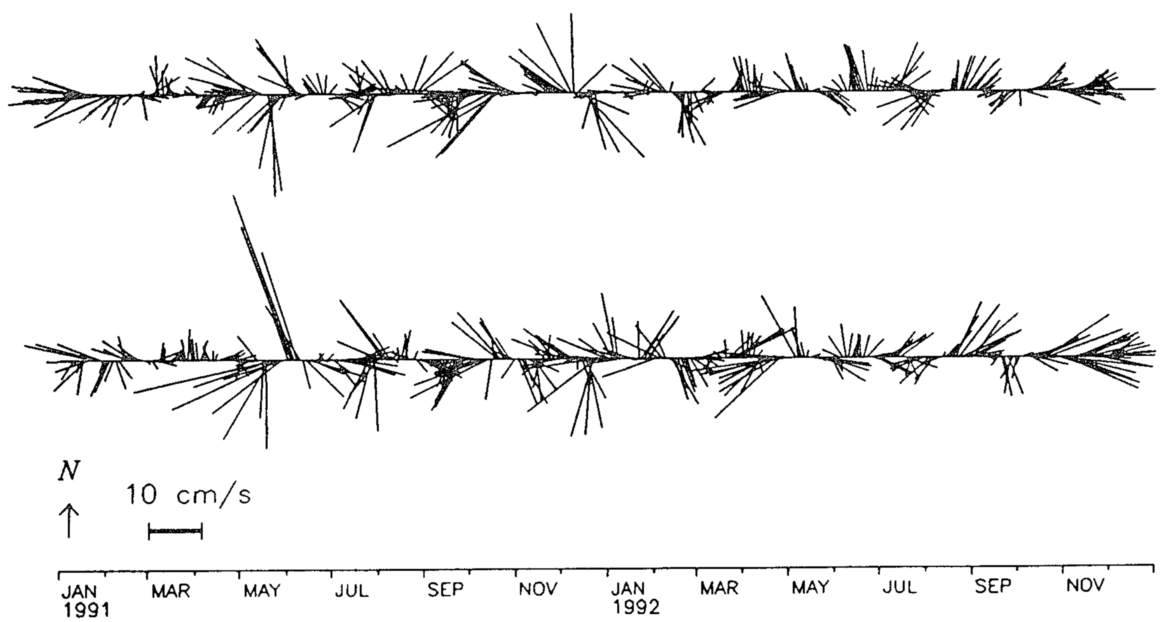

Mooring DB2/907 * U and V components
depths of 496, 895, 2595, 2995, 3850 M.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
EAST
NORTH
20
0
-20


9071B1DG24
496 m
9072C1DG24
895 m
9073C1DG24
2595 m
9074Q1DG24
2995 m
9075C1DG24
3850 m
N
0
500
KILOMETERS

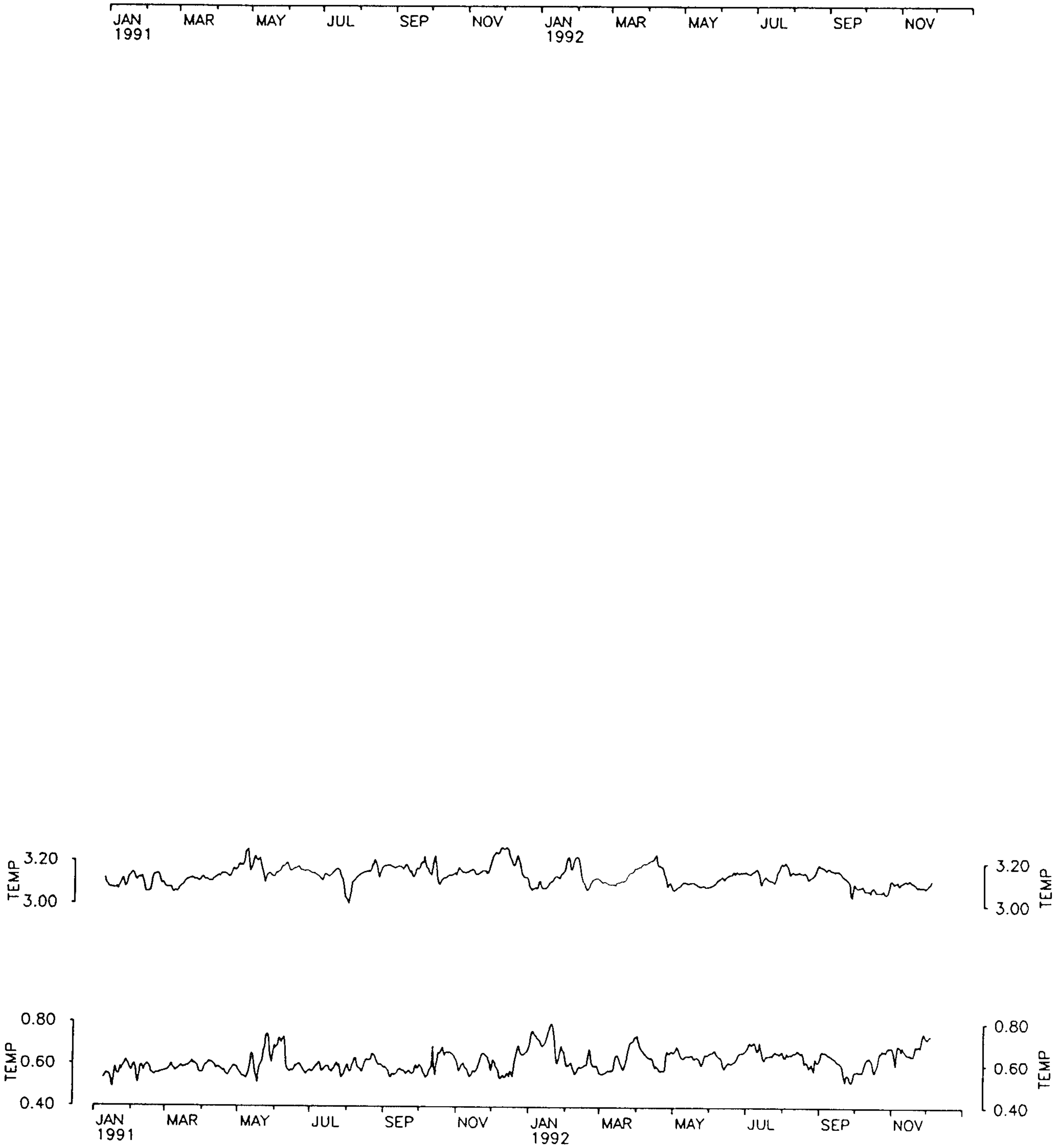
Mooring DB3/908

depths of 2592, 3918 m.

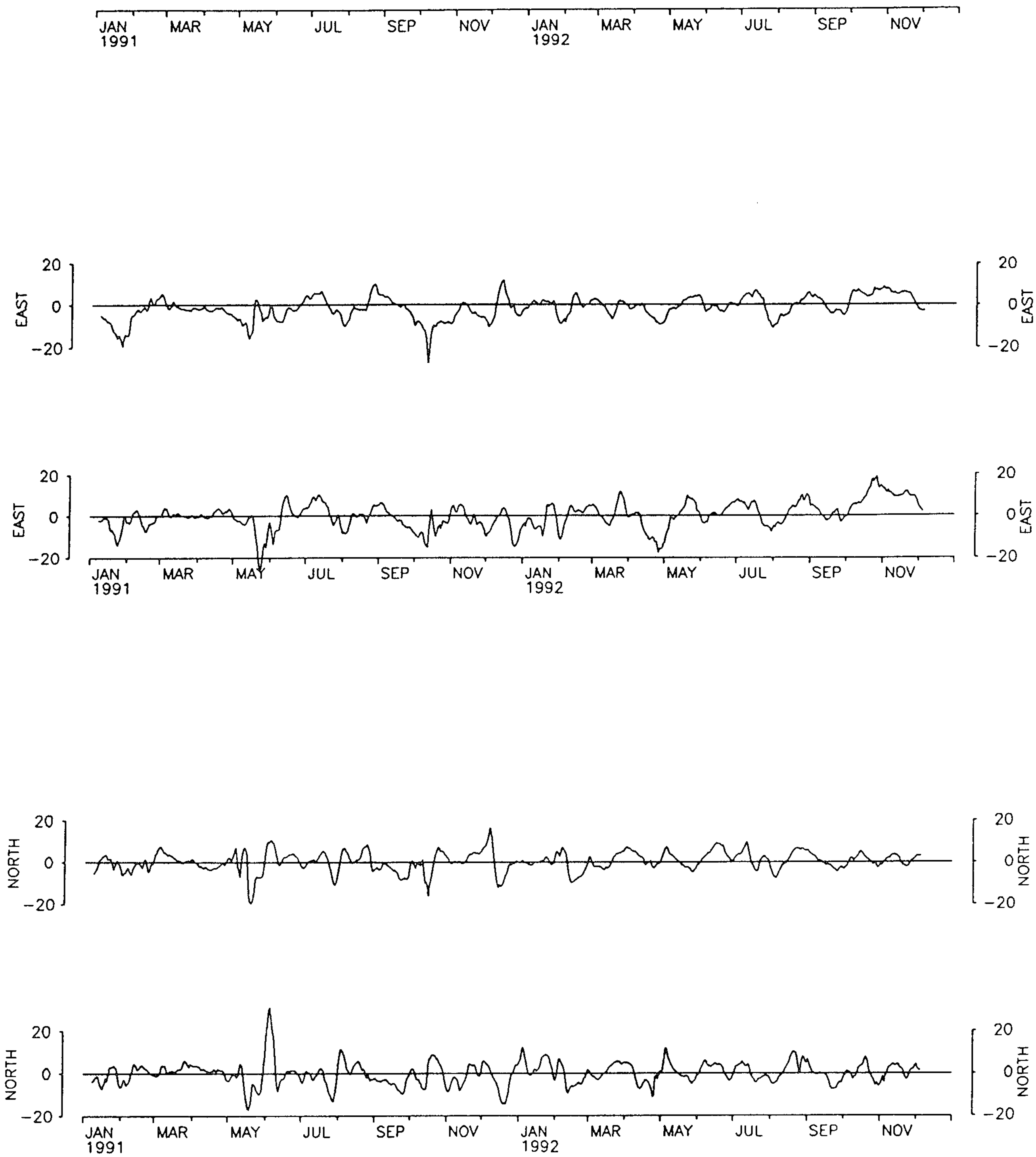


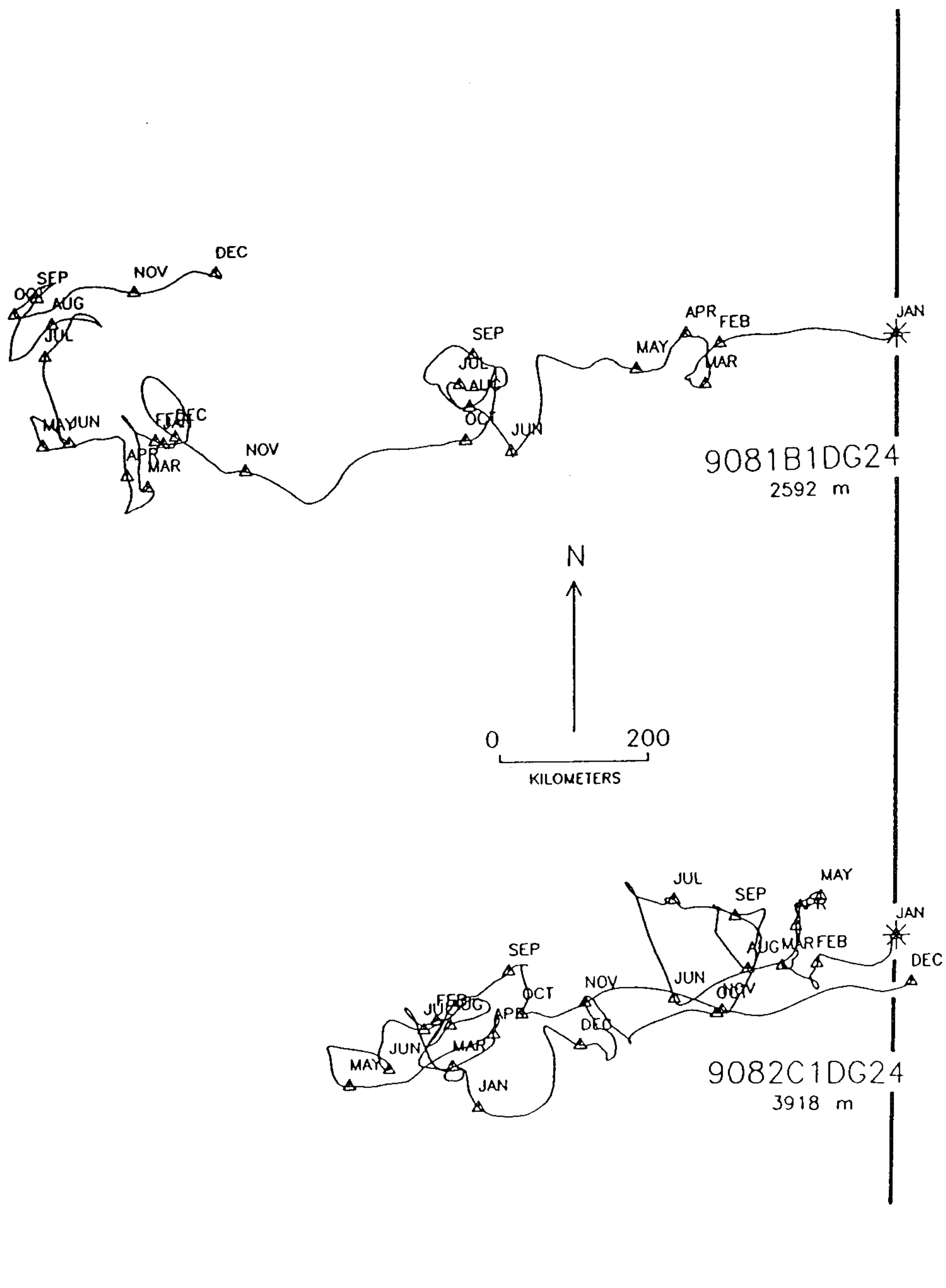


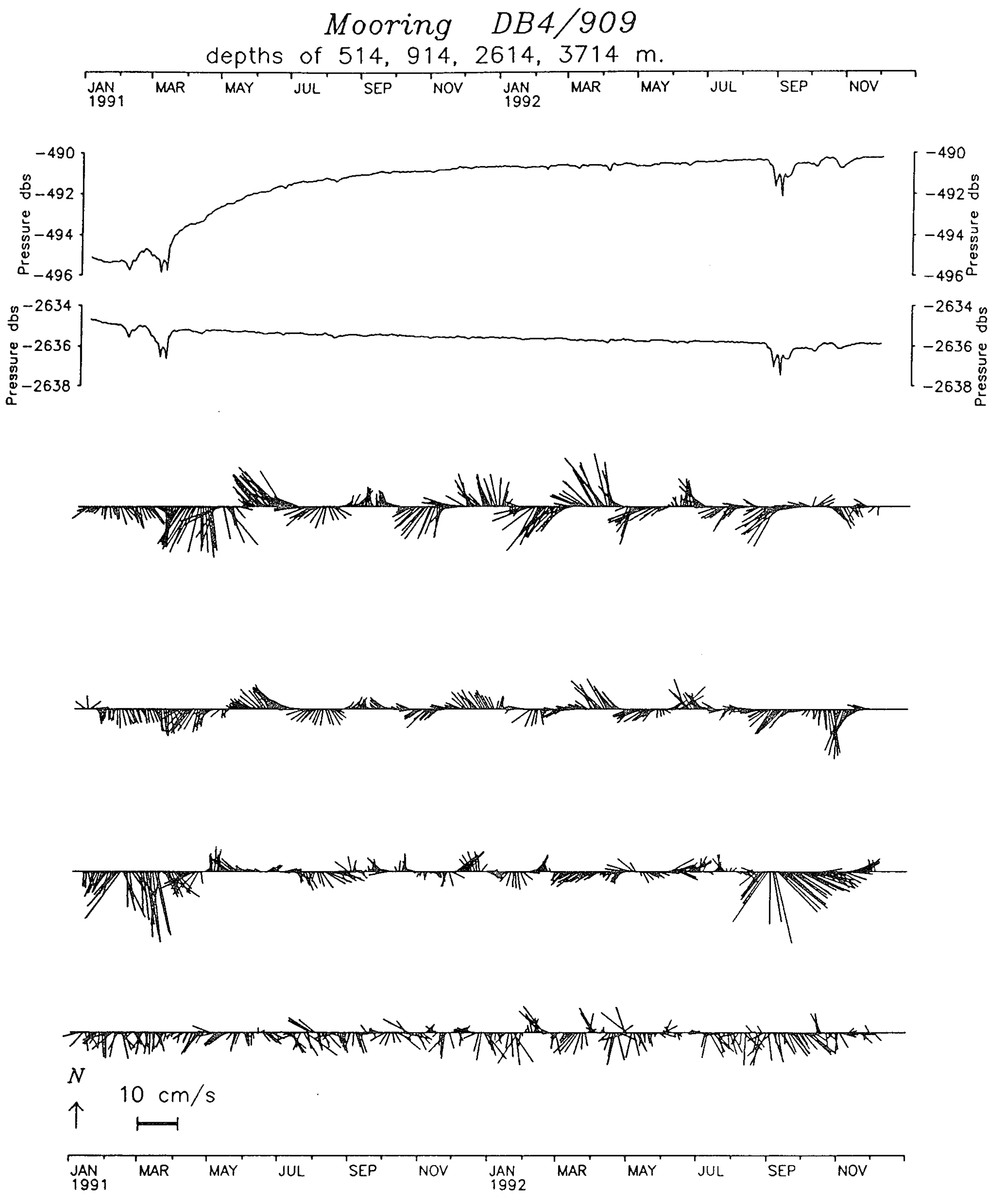
Mooring DB3/908
* Temperatures at 2592, 3918 m.



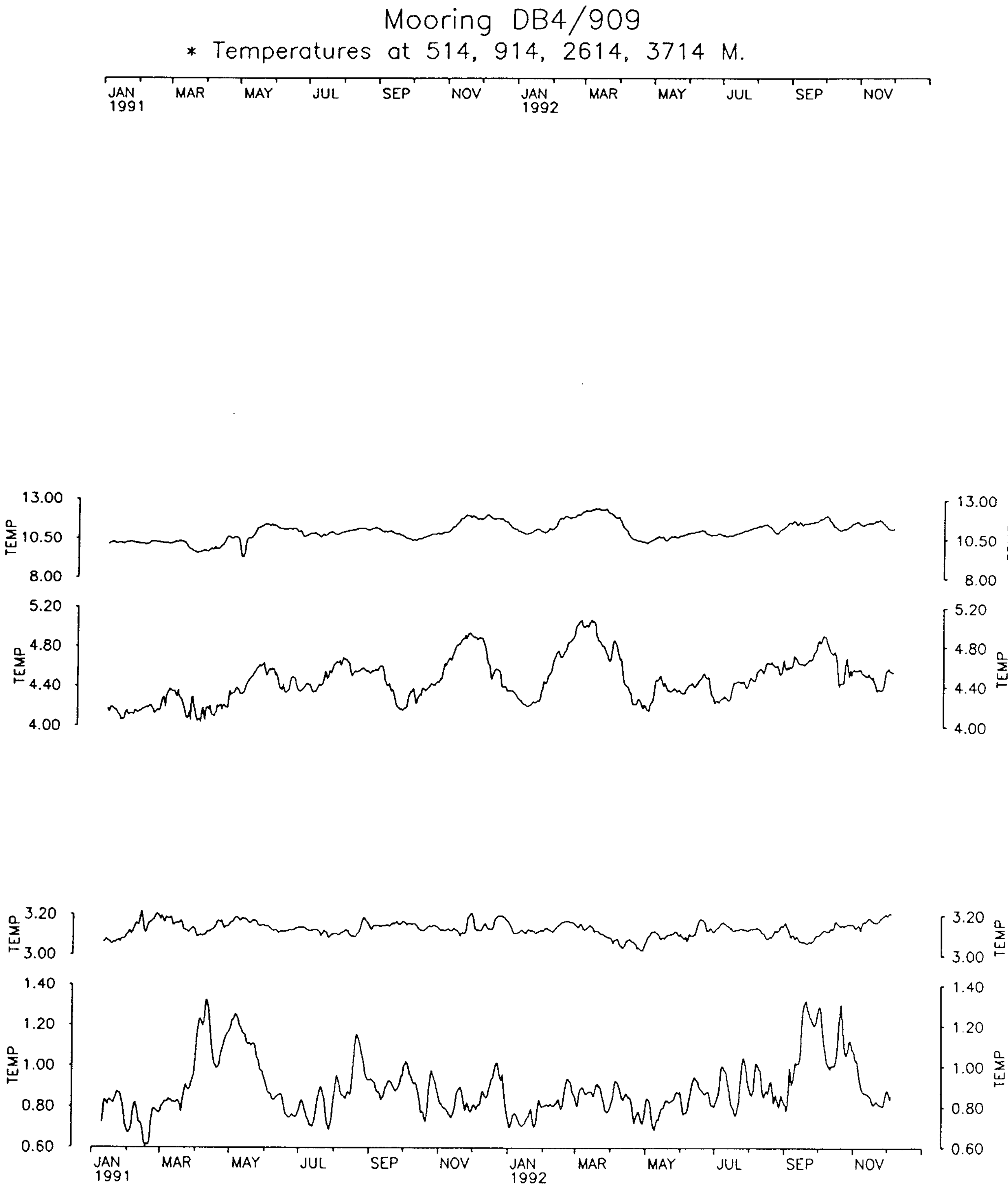
Mooring DB3/908 * U and V components
depths of 2592, 3918 m.

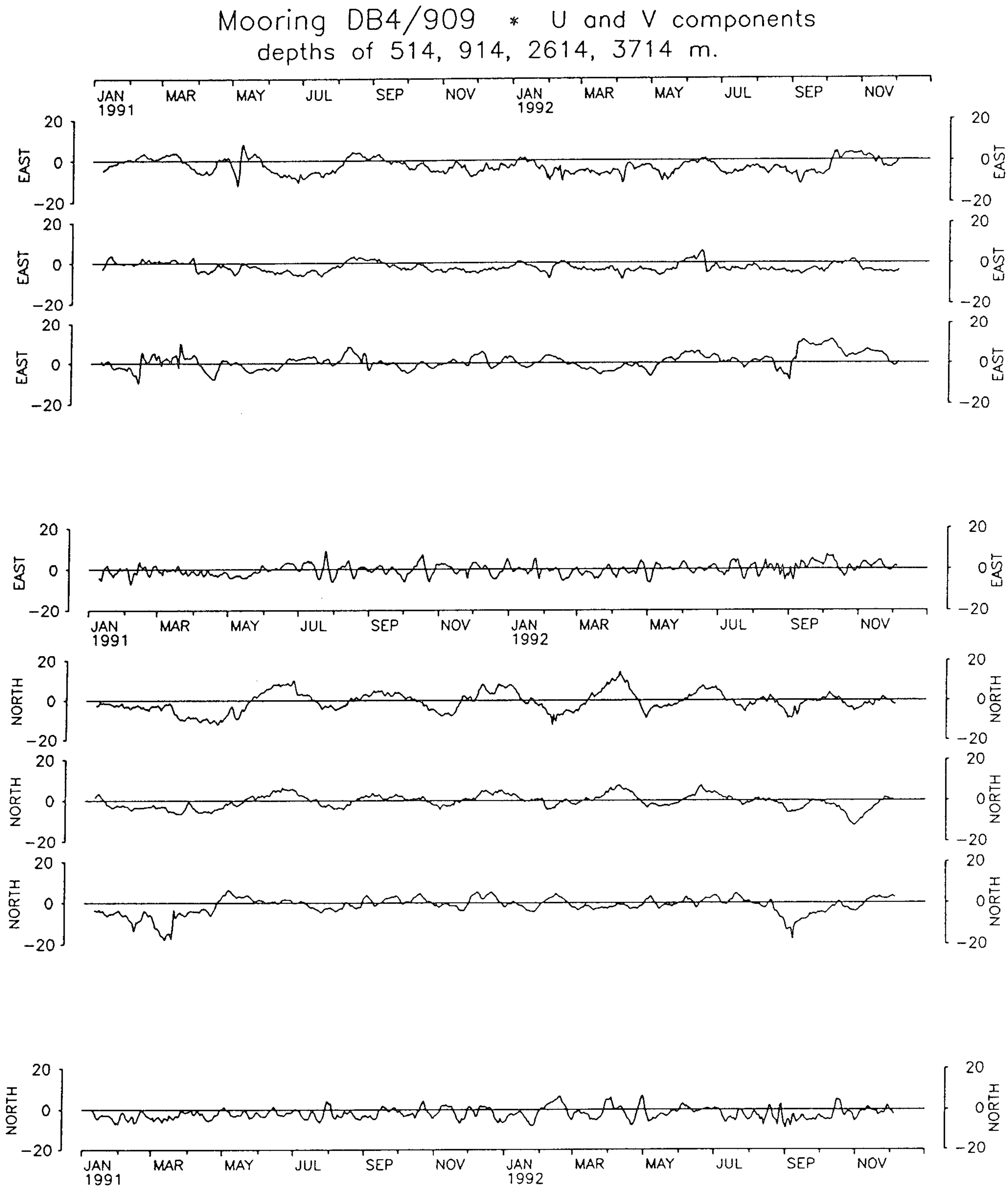


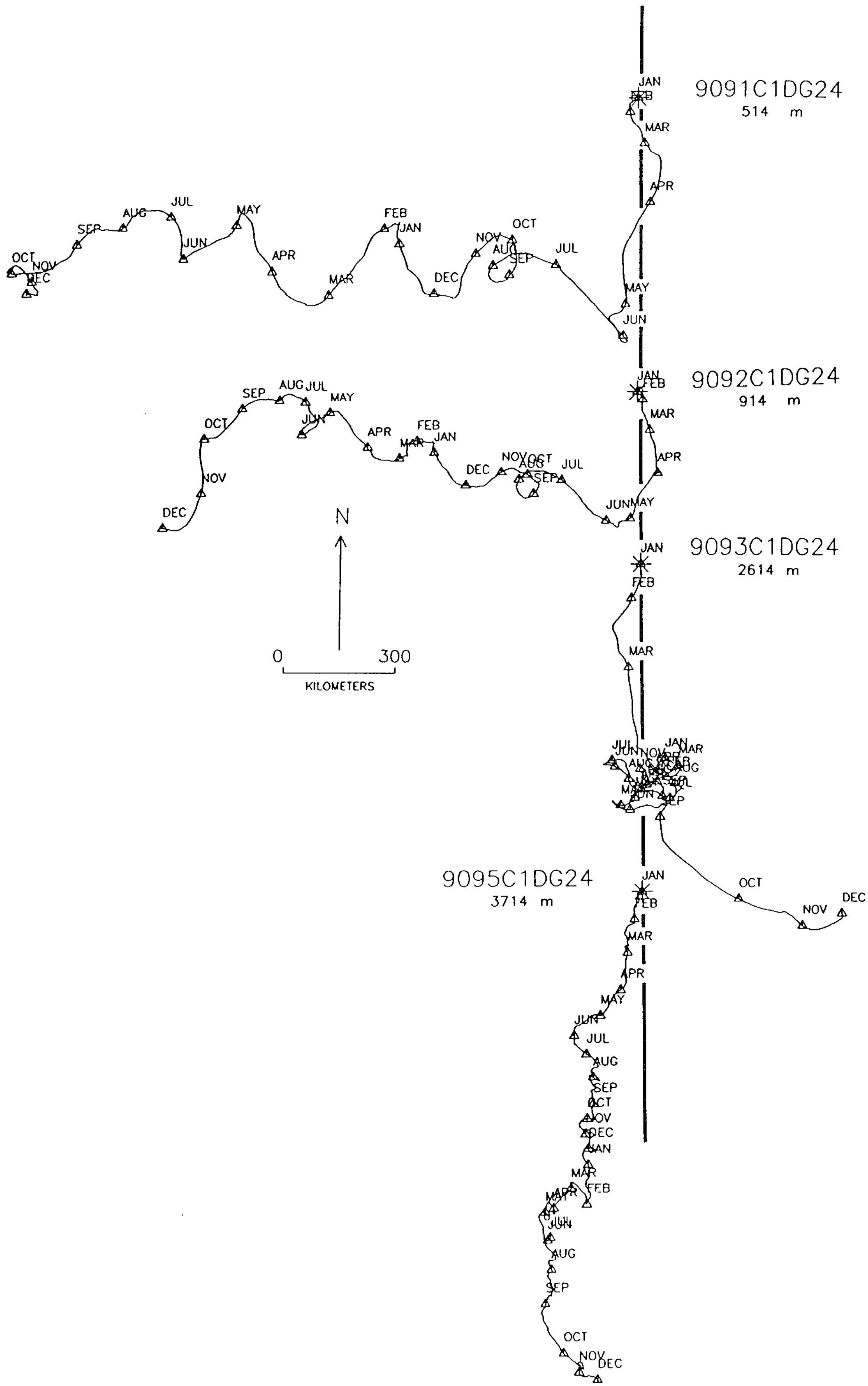

9081B1DG24
2592 m
N
0
200
KILOMETERS
9082C1DG24
3918 m
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

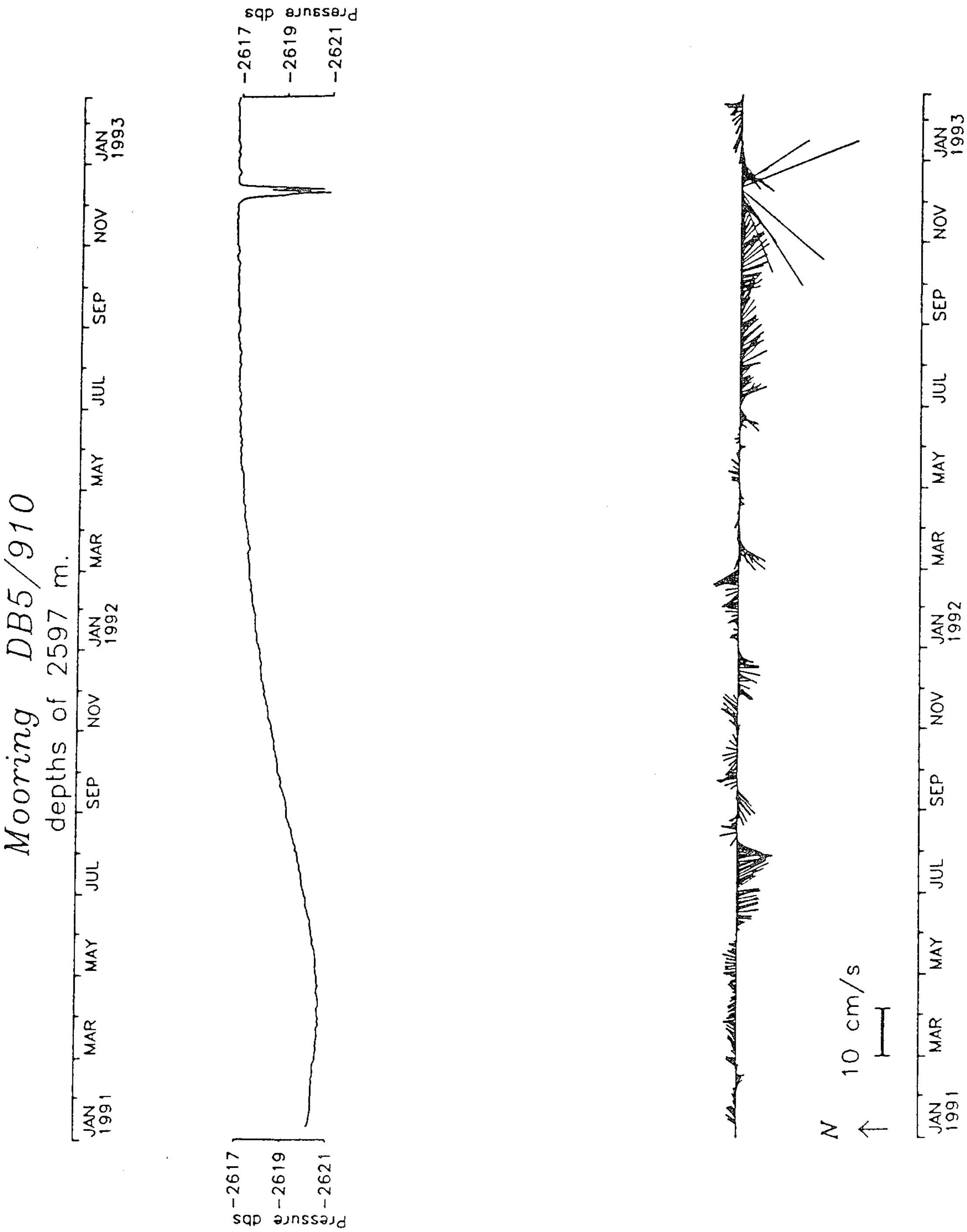


Mooring DB4/909
depths of 514, 914, 2614, 3714 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
Pressure dbs
-490
-492
-494
-496
-2634
-2636
-2638
N
10 cm/s


Mooring DB4/909
* Temperatures at 514, 914, 2614, 3714 M.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
TEMP
13.00
10.50
8.00
5.20
4.80
4.40
4.00
3.20
3.00
1.40
1.20
1.00
0.80
0.60

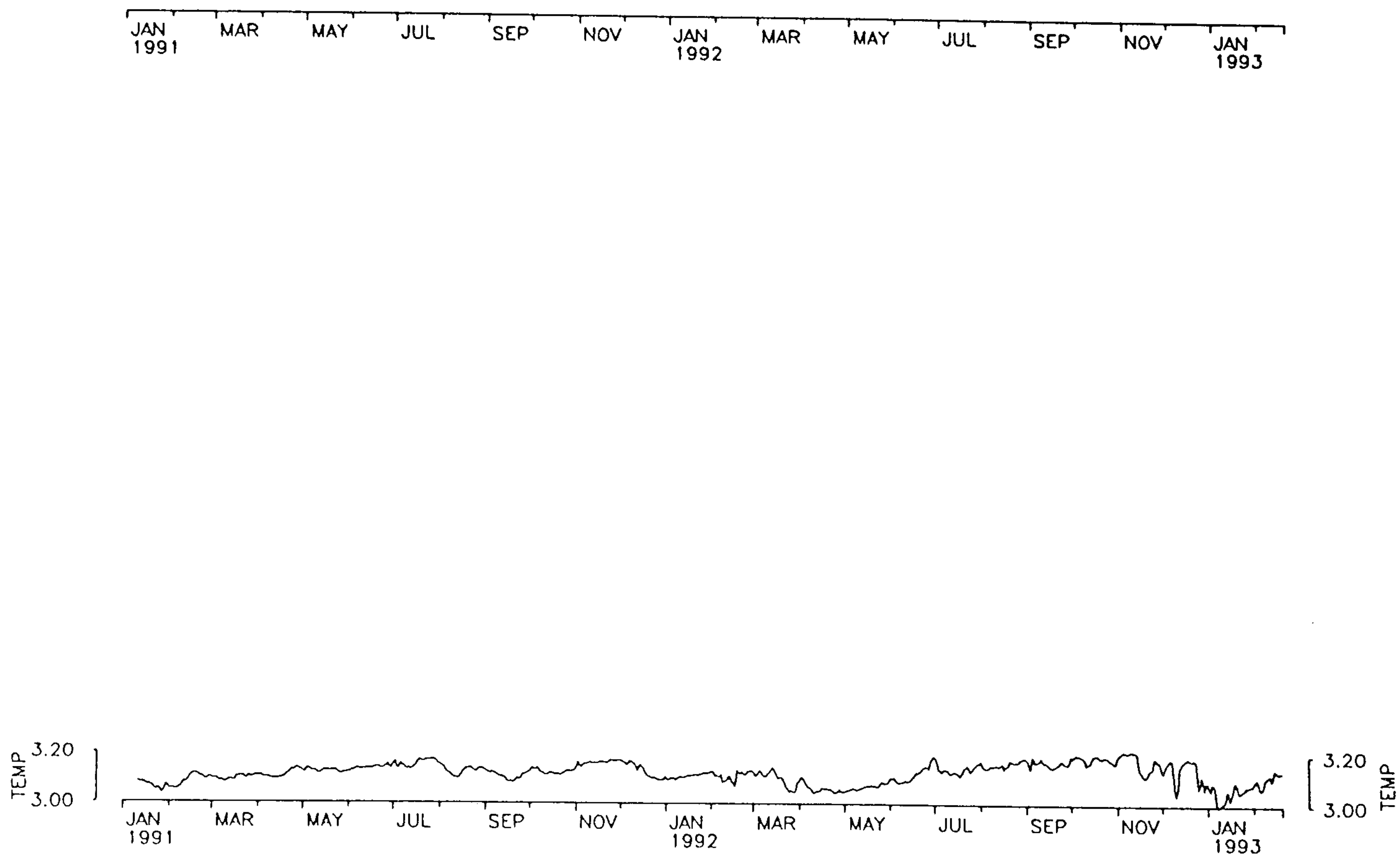

Mooring DB4/909 * U and V components
depths of 514, 914, 2614, 3714 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
EAST
NORTH
20
0
-20


9091C1DG24
514 m
9092C1DG24
914 m
9093C1DG24
2614 m
9095C1DG24
3714 m
N
0
300
KILOMETERS

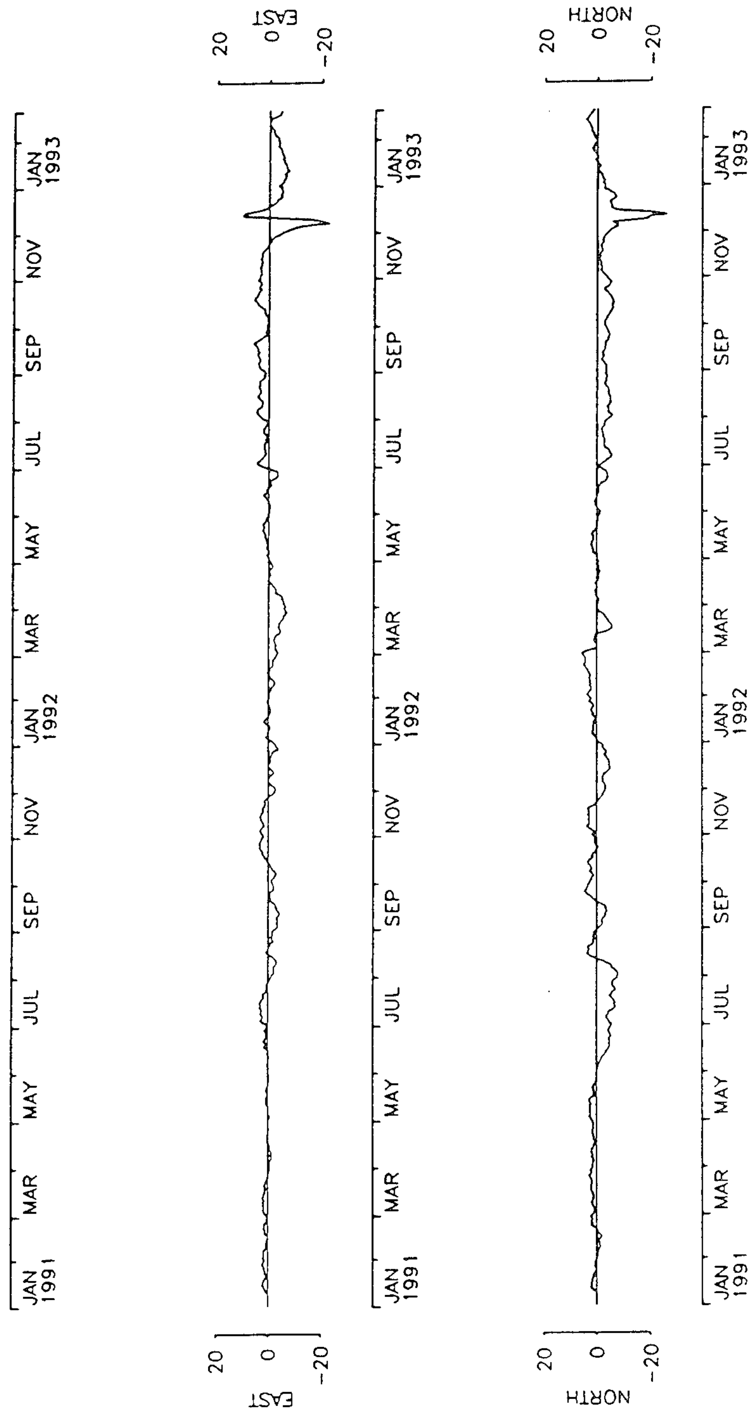

Mooring DB5/910
depths of 2597 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
JAN 1993
-2617
-2619
-2621
Pressure dbs
N
10 cm/s

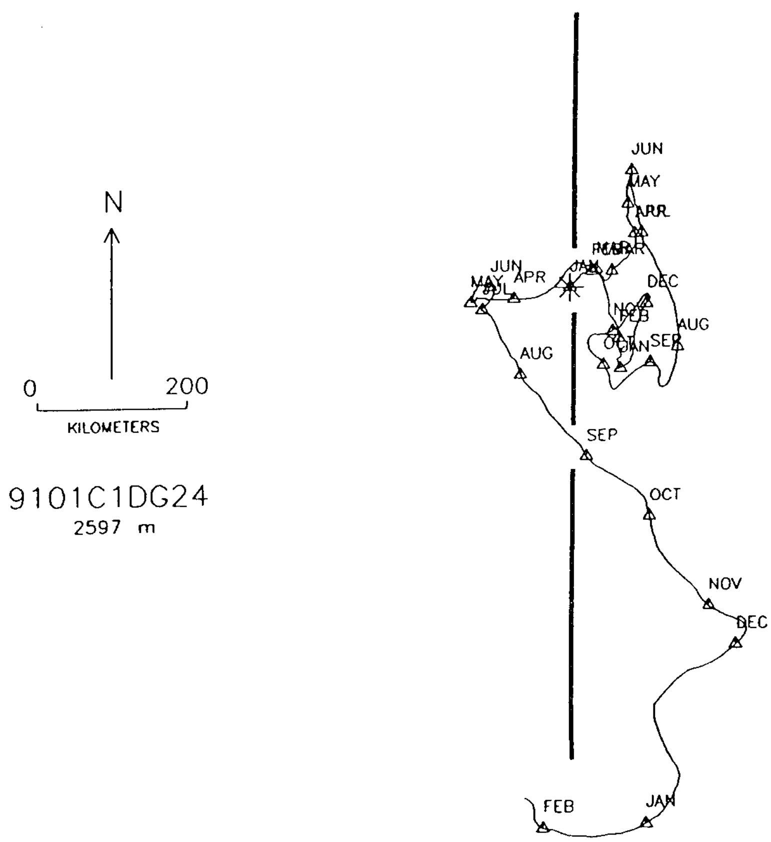
Mooring DB5/910

* Temperatures at 2597 m.

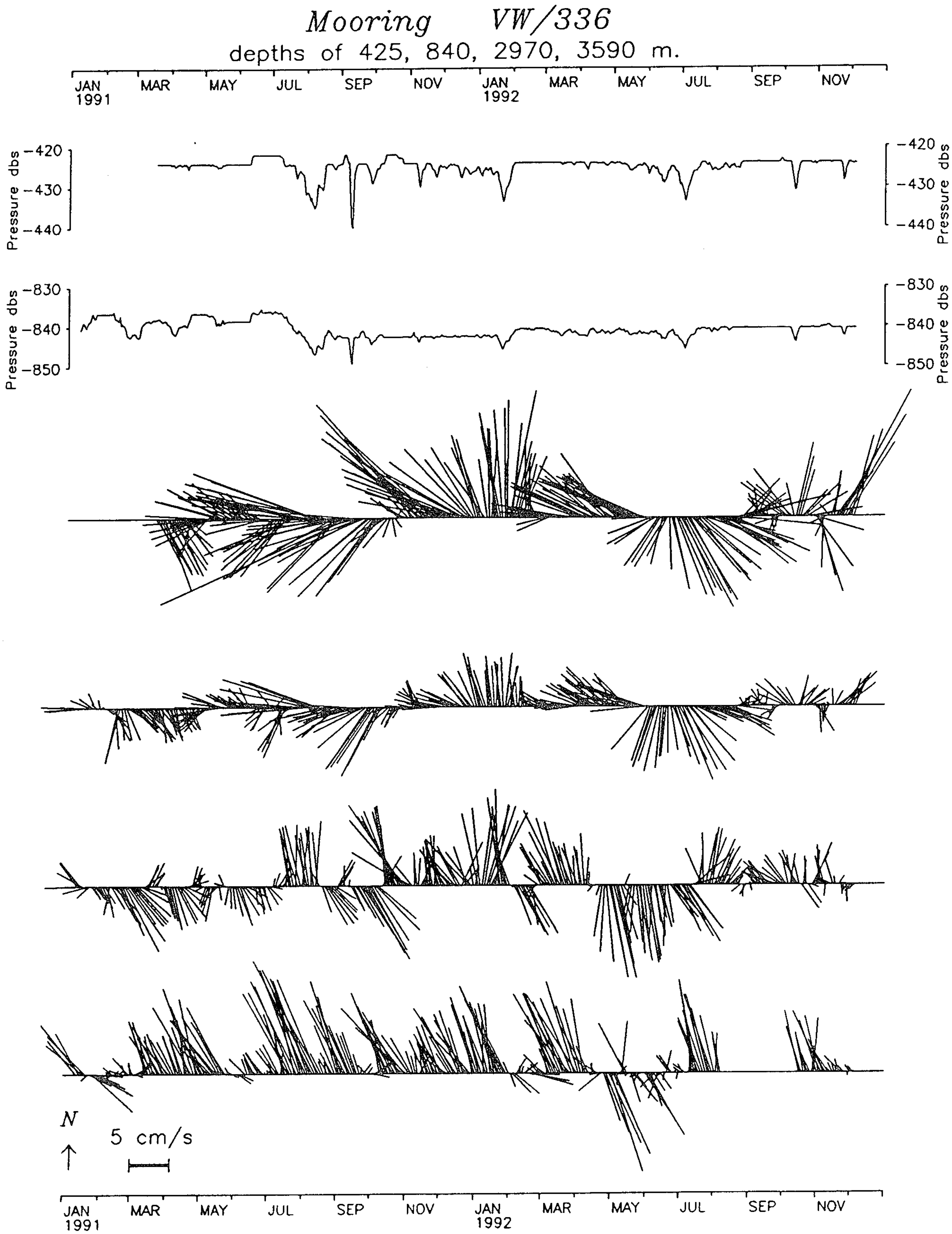


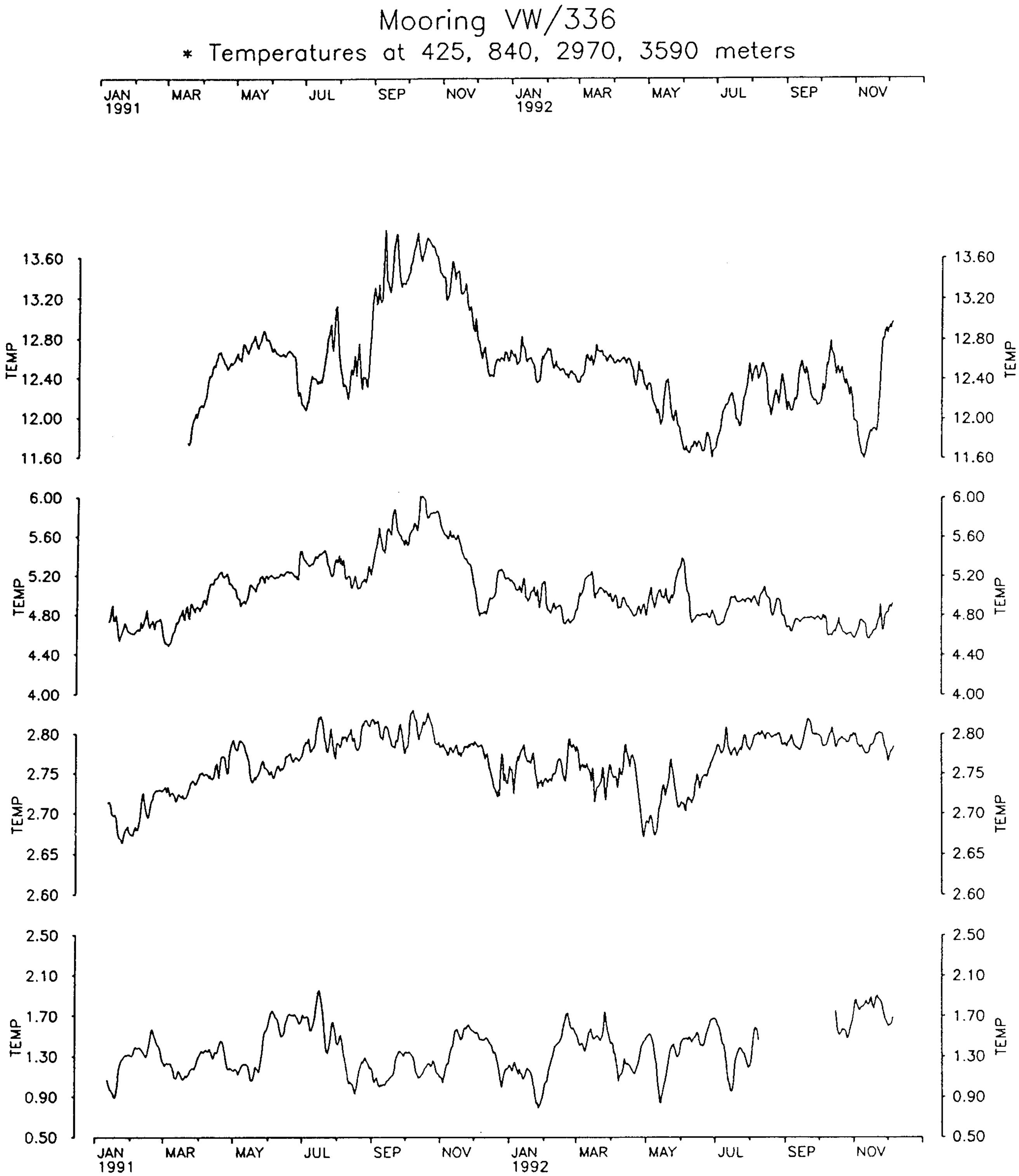
Mooring DB5/910 * U and V components
depths of 2597 m.



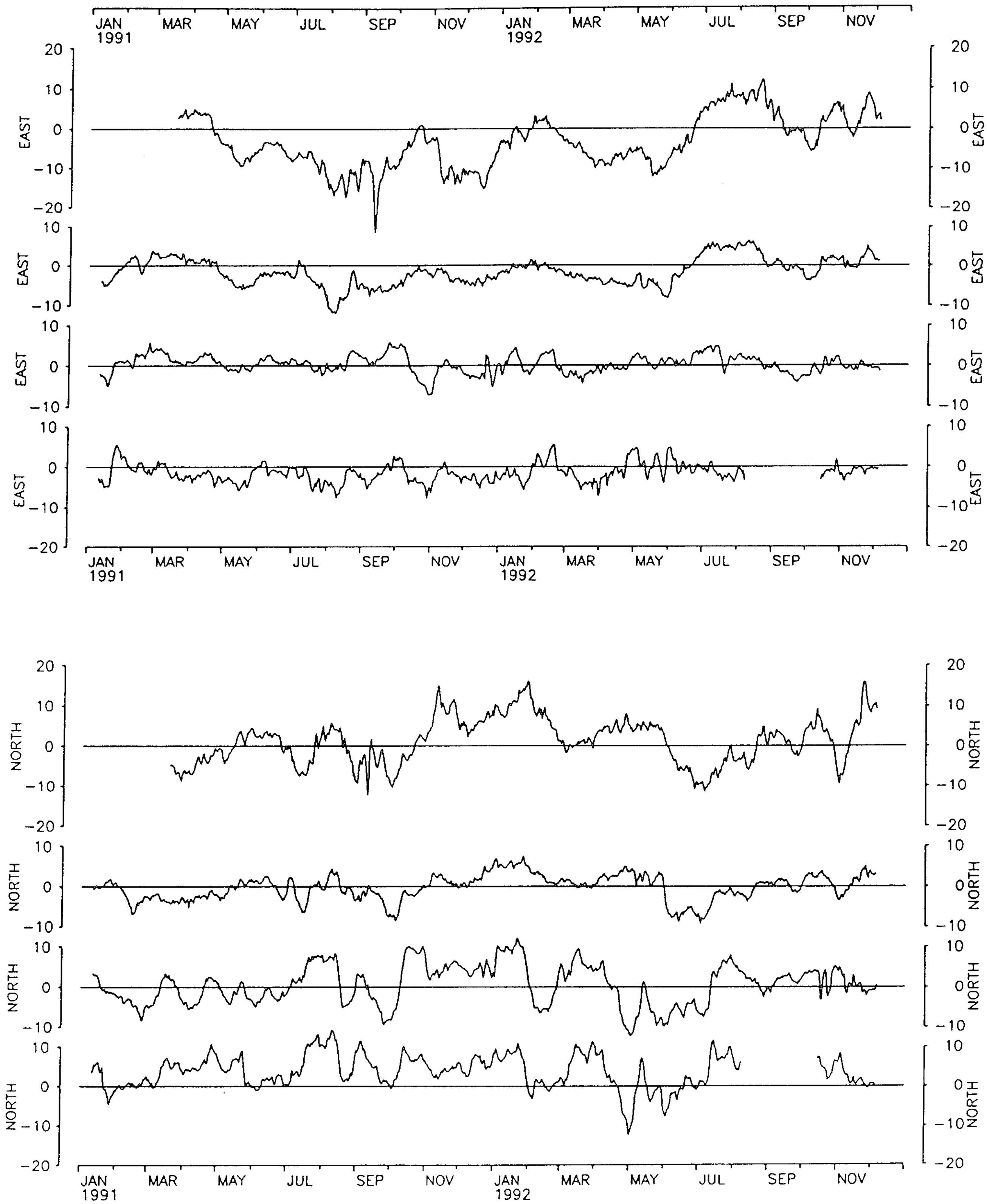


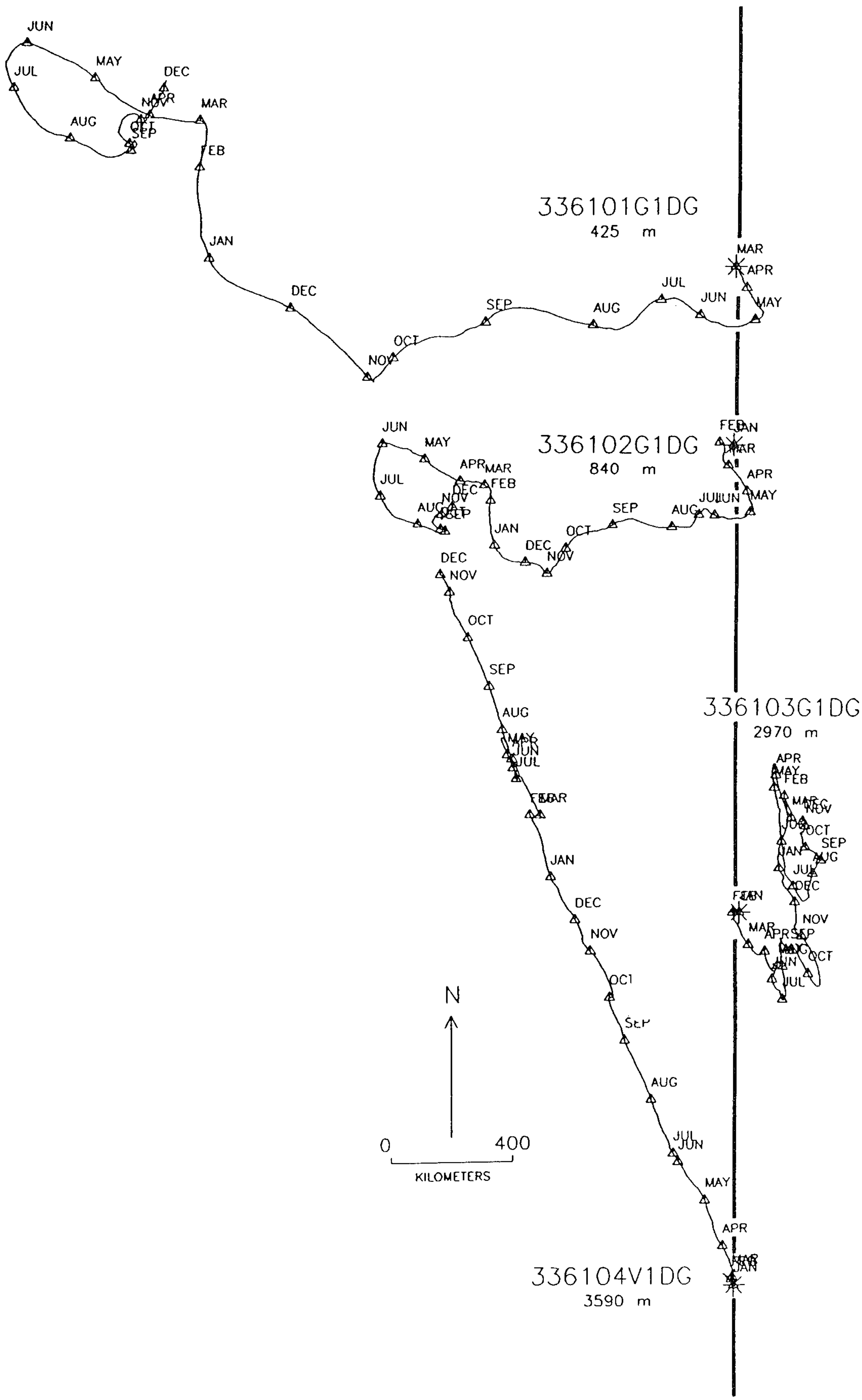
N
0
200
KILOMETERS
9101C1DG24
2597 m
JUN
MAY
APR
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB

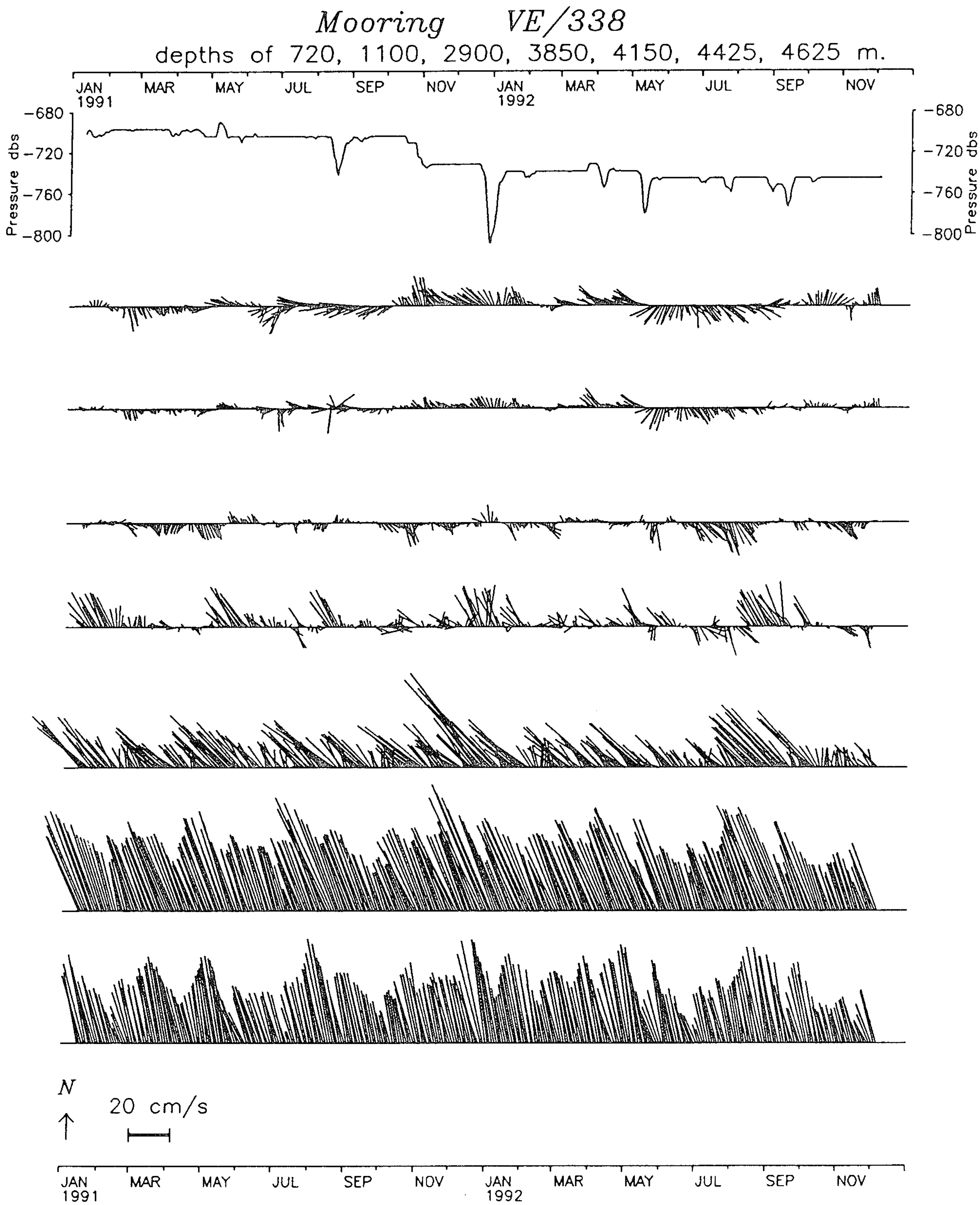

Mooring VW/336
depths of 425, 840, 2970, 3590 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
Pressure dbs
-420
-430
-440
Pressure dbs
-830
-840
-850
N
5 cm/s

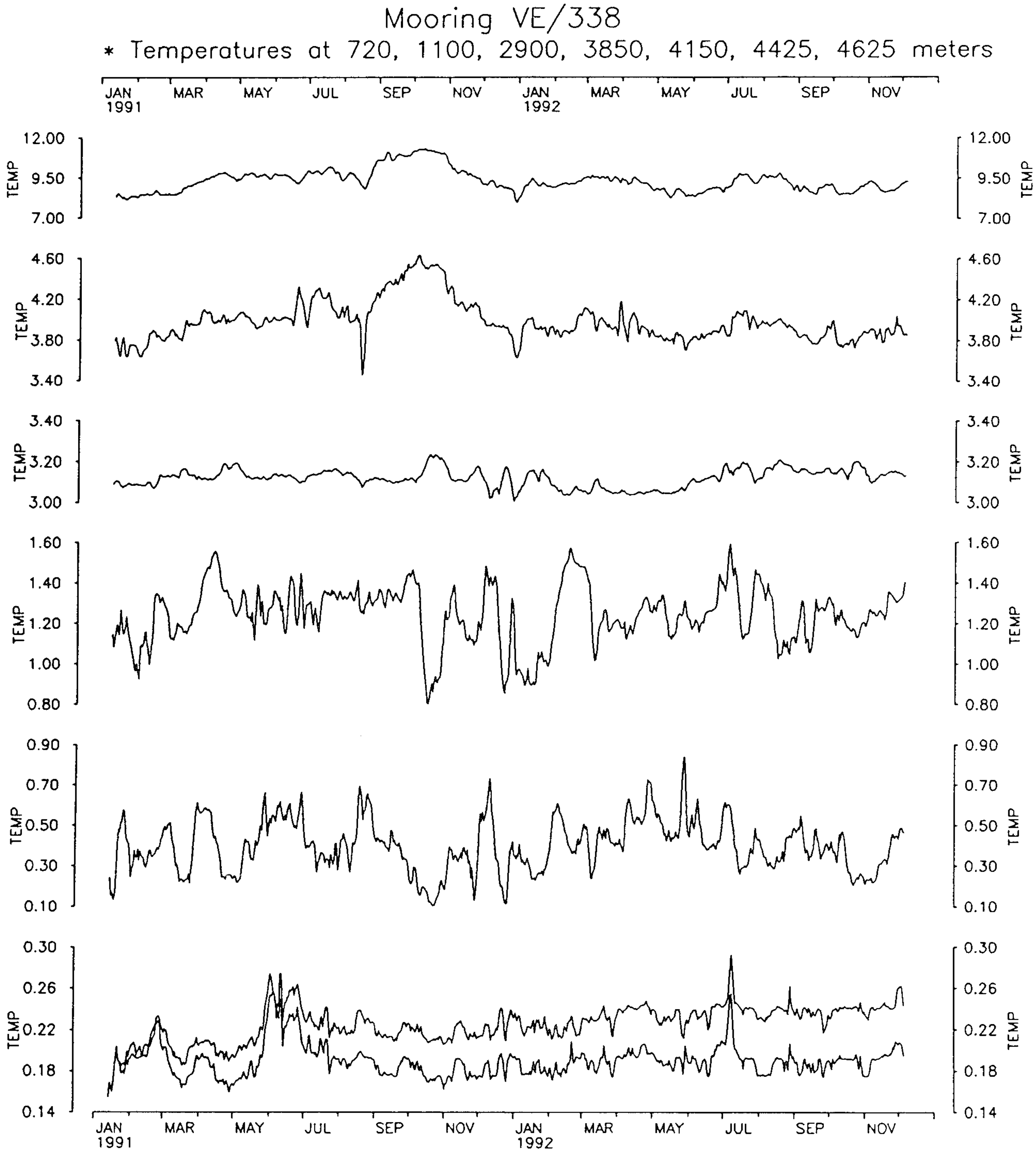

Mooring VW/336
* Temperatures at 425, 840, 2970, 3590 meters
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
TEMP
13.60
13.20
12.80
12.40
12.00
11.60
6.00
5.60
5.20
4.80
4.40
4.00
2.80
2.75
2.70
2.65
2.60
2.50
2.10
1.70
1.30
0.90
0.50

Mooring VW/336 * U and V components
depths of 425, 840, 2970, 3590 m.



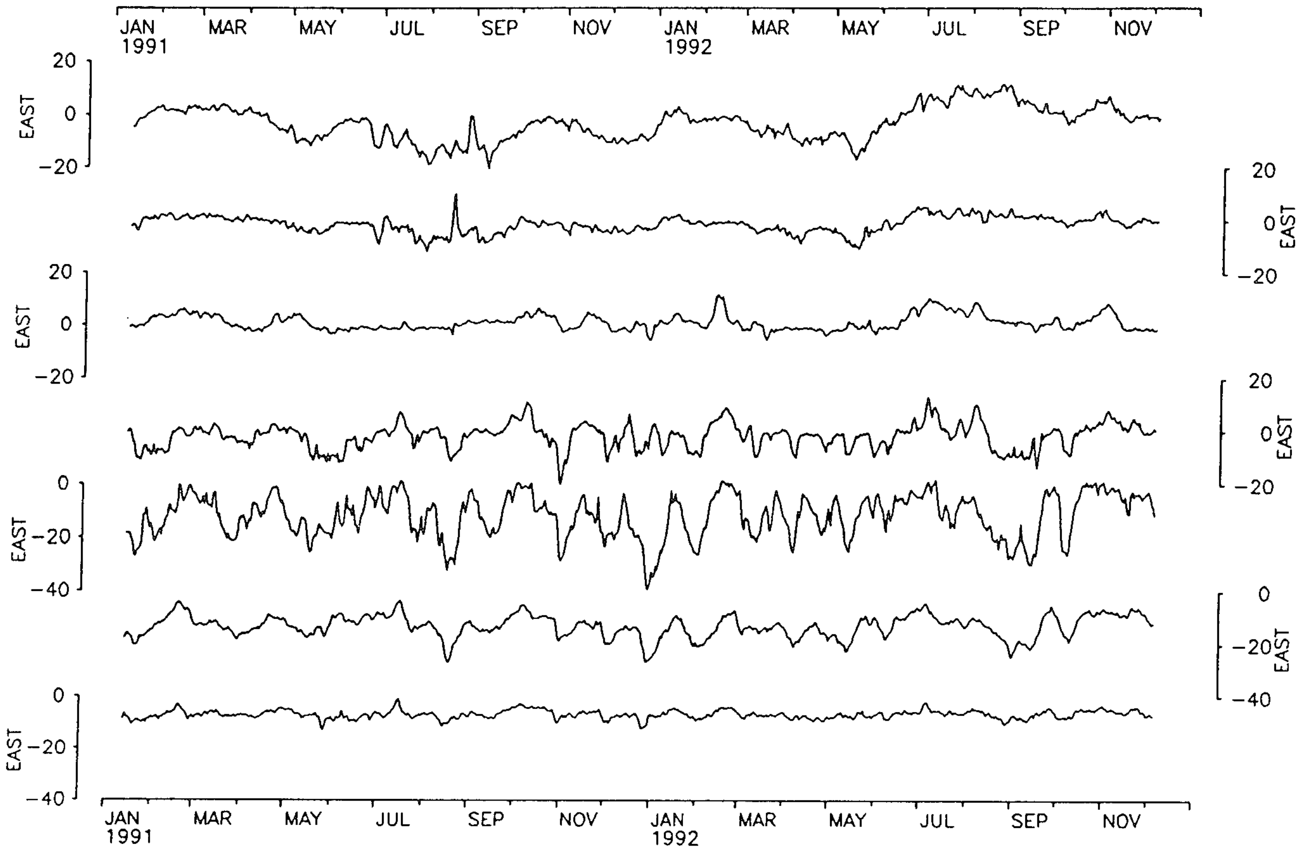

336101G1DG
425 m
336102G1DG
840 m
336103G1DG
2970 m
336104V1DG
3590 m
N
0
400
KILOMETERS

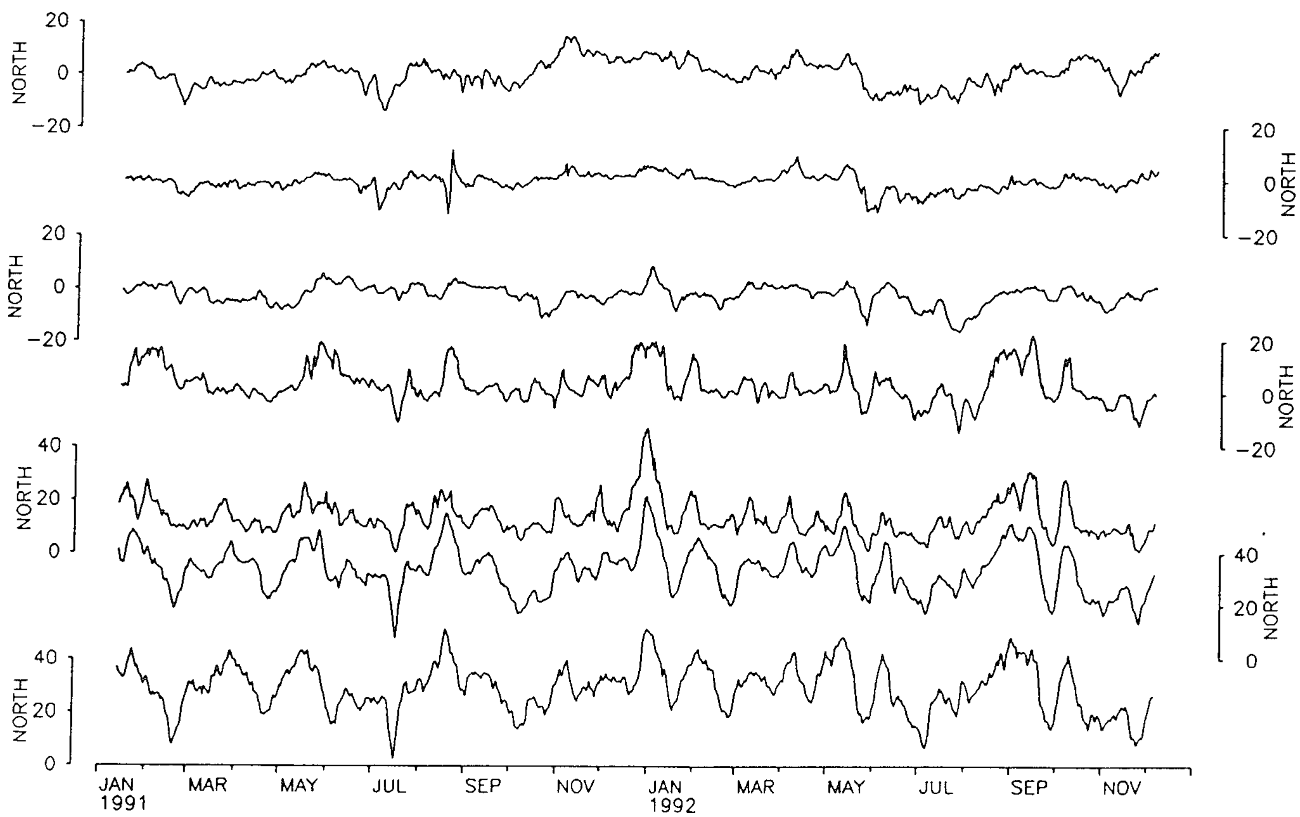

Mooring VE/338
depths of 720, 1100, 2900, 3850, 4150, 4425, 4625 m.
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
Pressure dbs
−680
−720
−760
−800
N
20 cm/s

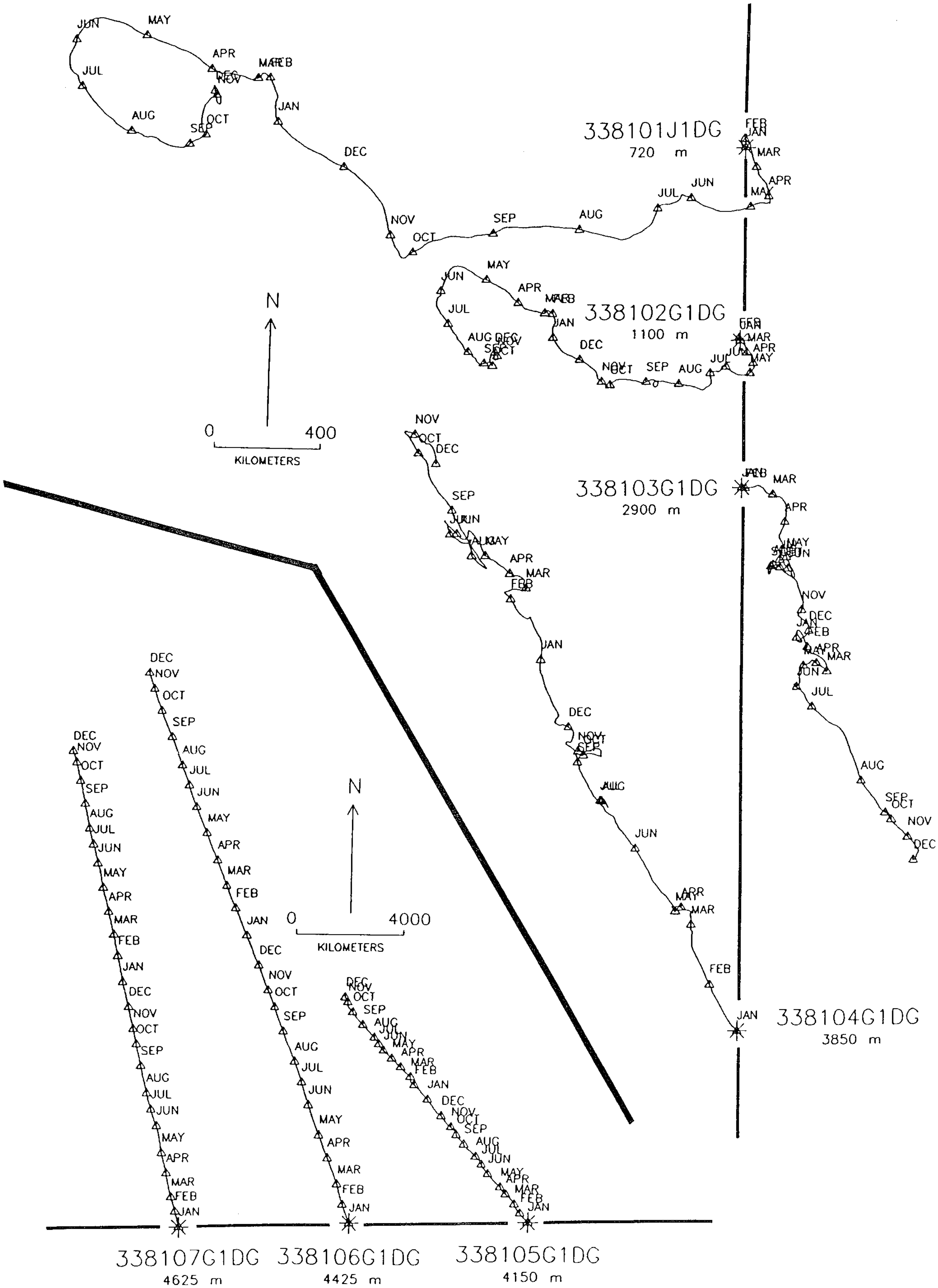


Mooring VE/338
* Temperatures at 720, 1100, 2900, 3850, 4150, 4425, 4625 meters
JAN 1991
MAR
MAY
JUL
SEP
NOV
JAN 1992
MAR
MAY
JUL
SEP
NOV
TEMP
12.00
9.50
7.00
4.60
4.20
3.80
3.40
3.40
3.20
3.00
1.60
1.40
1.20
1.00
0.80
0.90
0.70
0.50
0.30
0.10
0.30
0.26
0.22
0.18
0.14

Mooring VE/338 * U and V components
depths of 720, 1100, 2900, 3850, 4150, 4425, 4625 M.

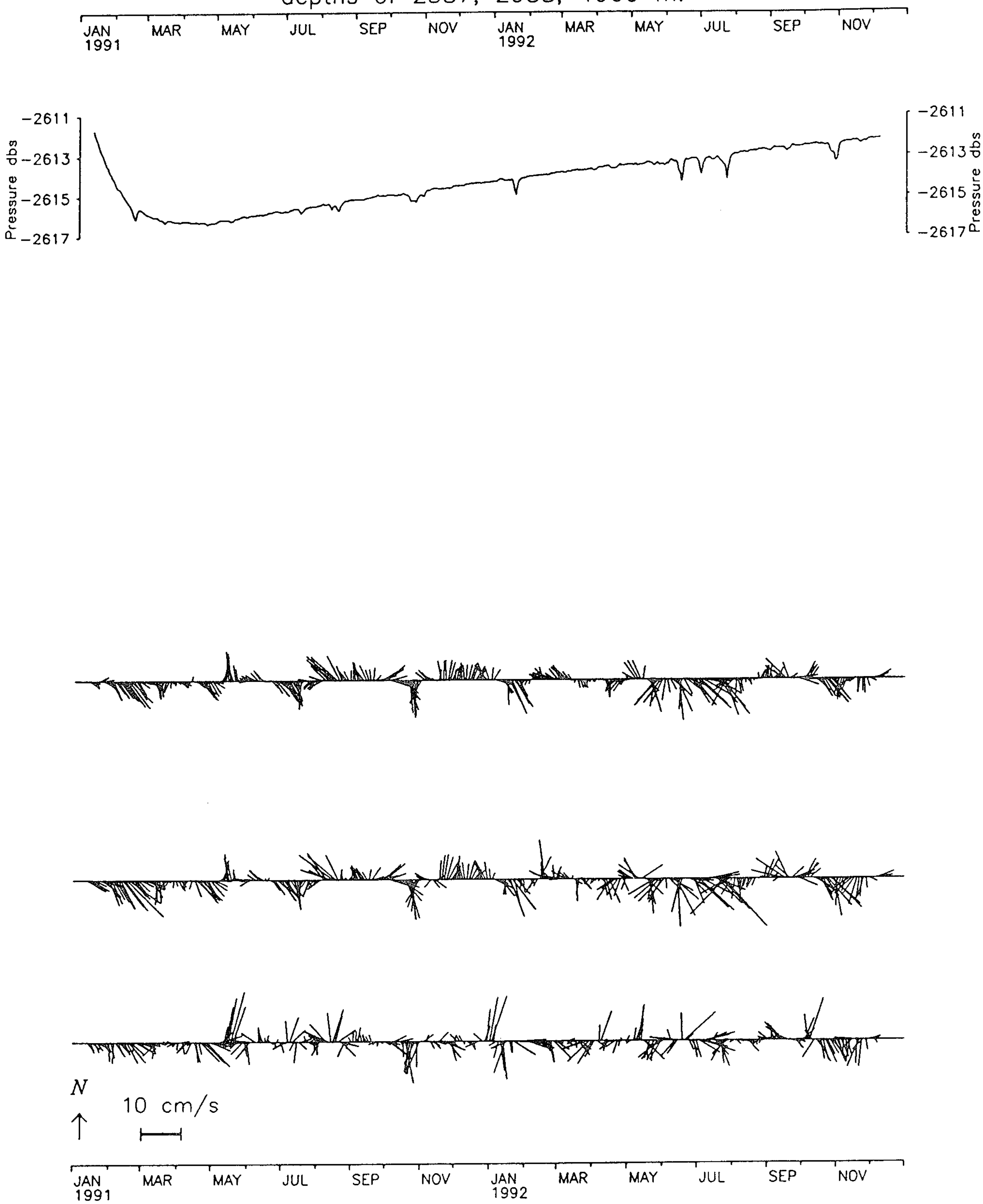





338101J1DG
720 m
338102G1DG
1100 m
338103G1DG
2900 m
338104G1DG
3850 m
338105G1DG
4150 m
338106G1DG
4425 m
338107G1DG
4625 m
N
0 400
KILOMETERS
N
0 4000
KILOMETERS

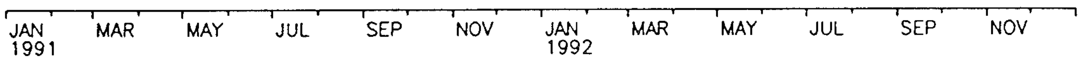
Mooring DB6/912

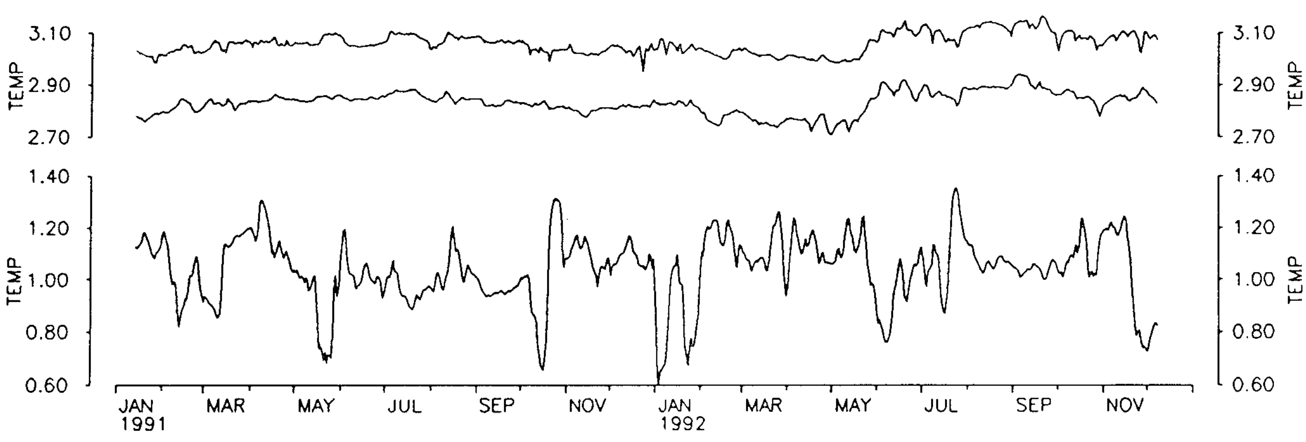
depths of 2587, 2988, 4060 m.



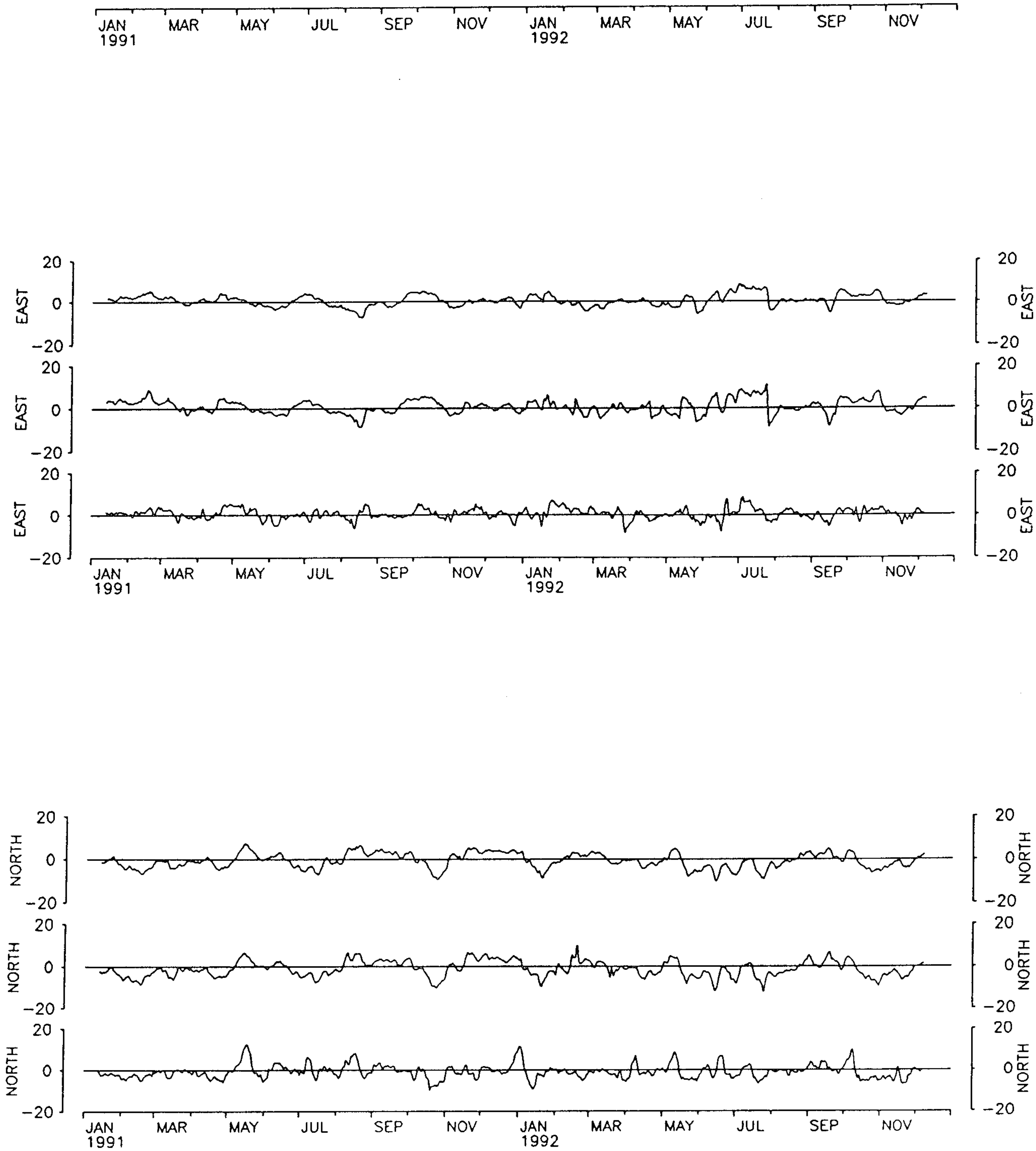
Mooring DB6/912

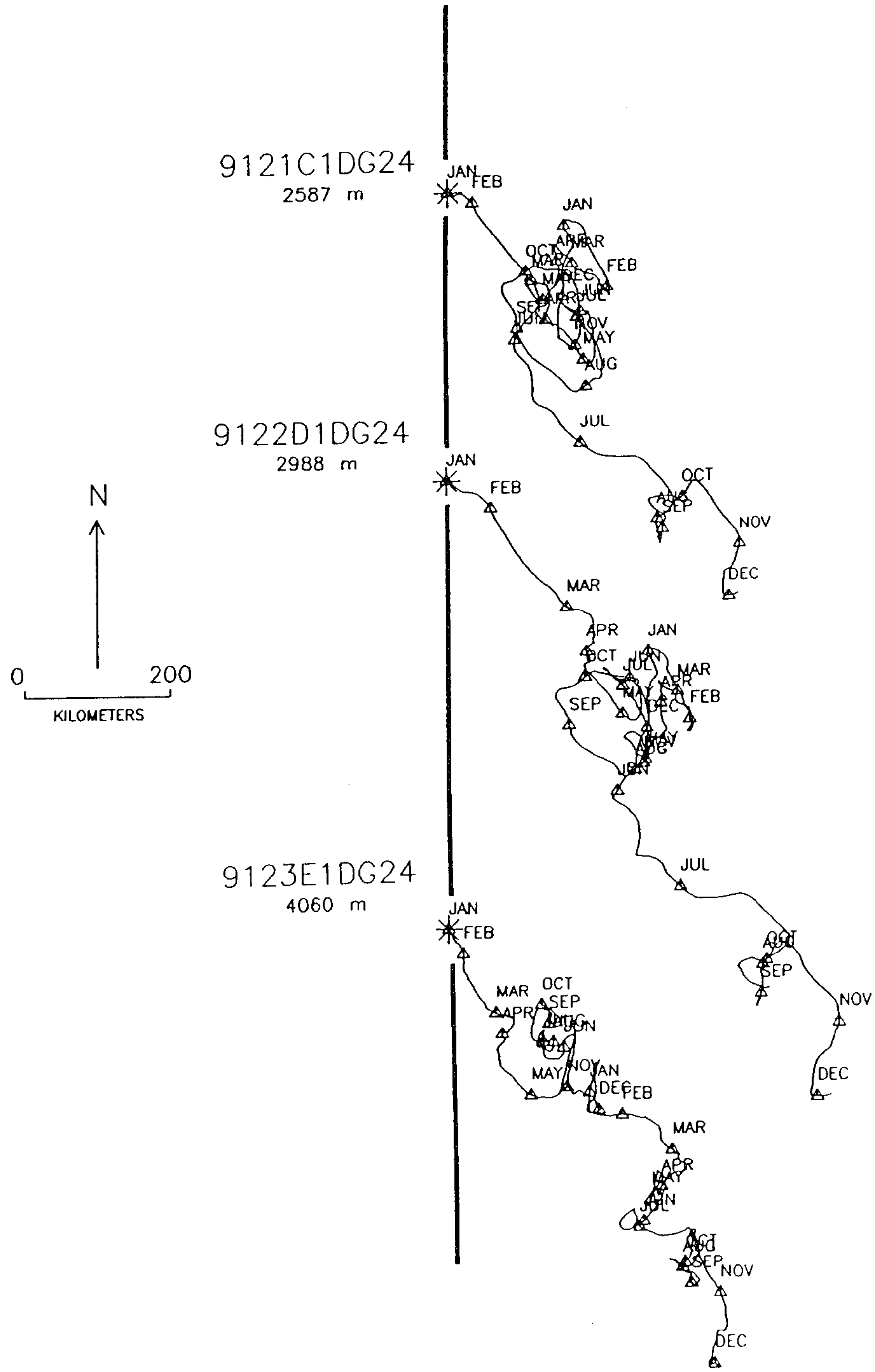
* Temperatures at 2587, 2988, 4060 M.





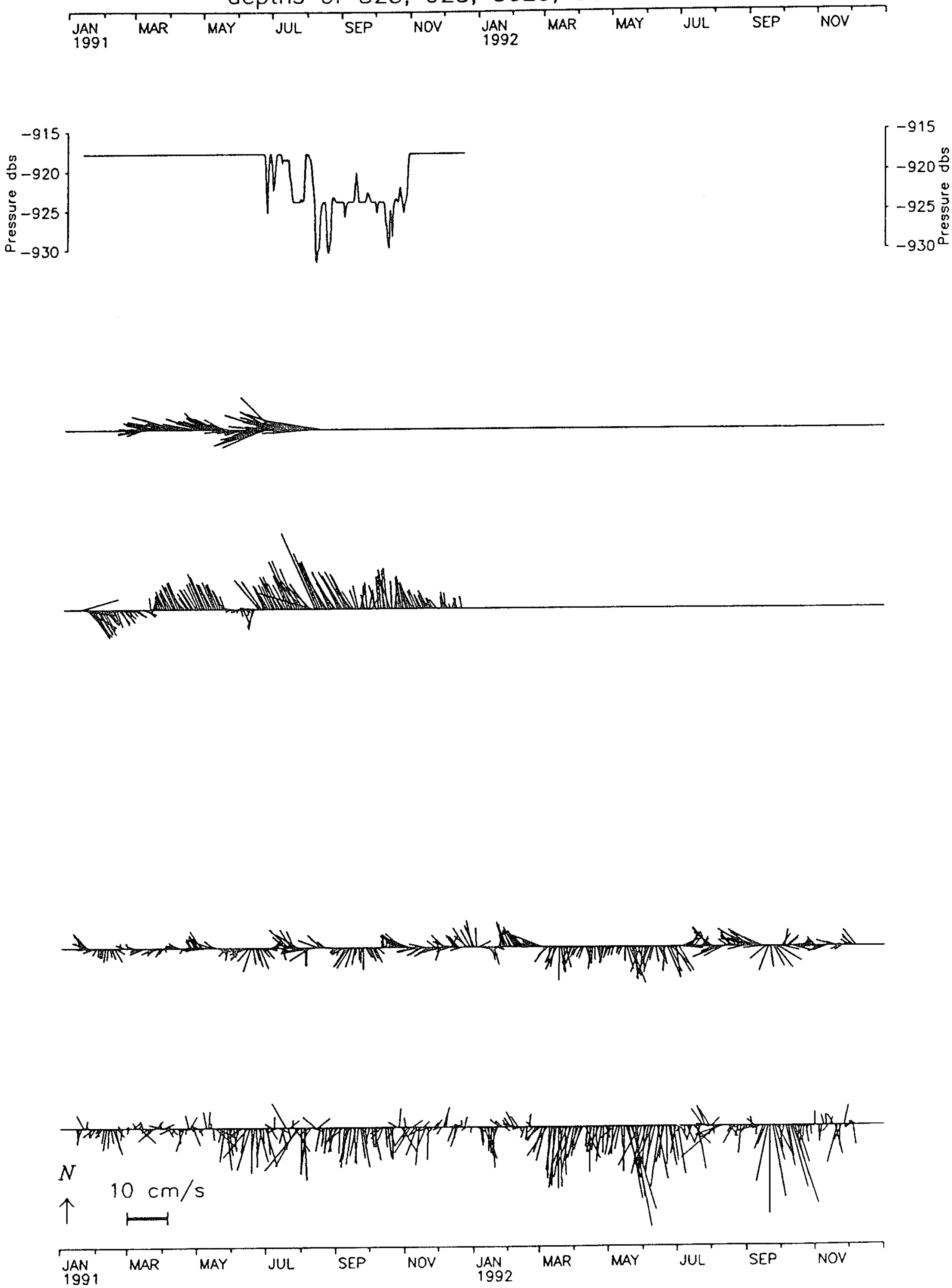
Mooring DB6/912 * U and V components
depths of 2578, 2988, 4060 m.




9121C1DG24
2587 m
9122D1DG24
2988 m
9123E1DG24
4060 m
N
0
200
KILOMETERS
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

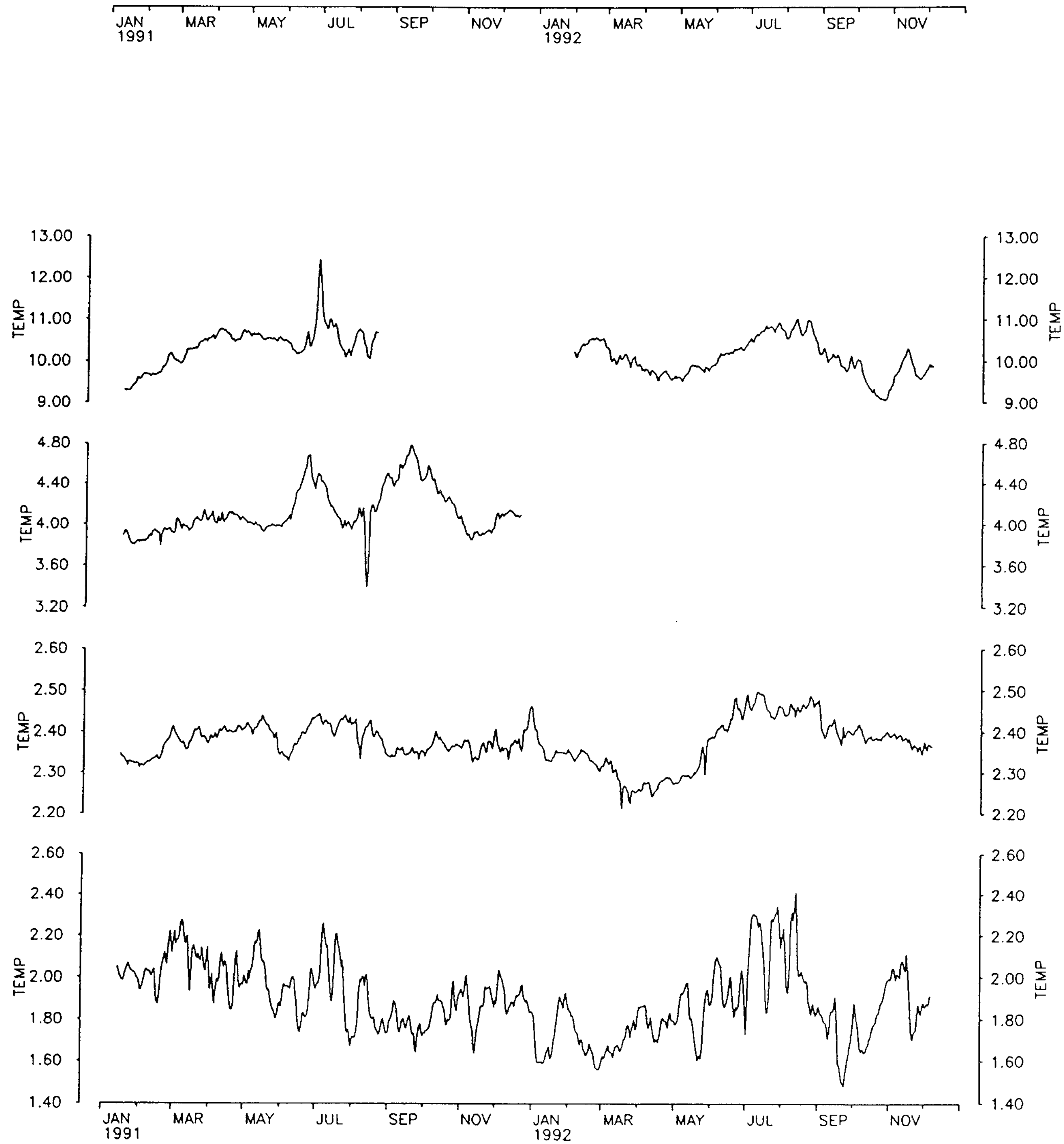
Mooring DBK/343

depths of 525, 925, 3025, 3602 m.

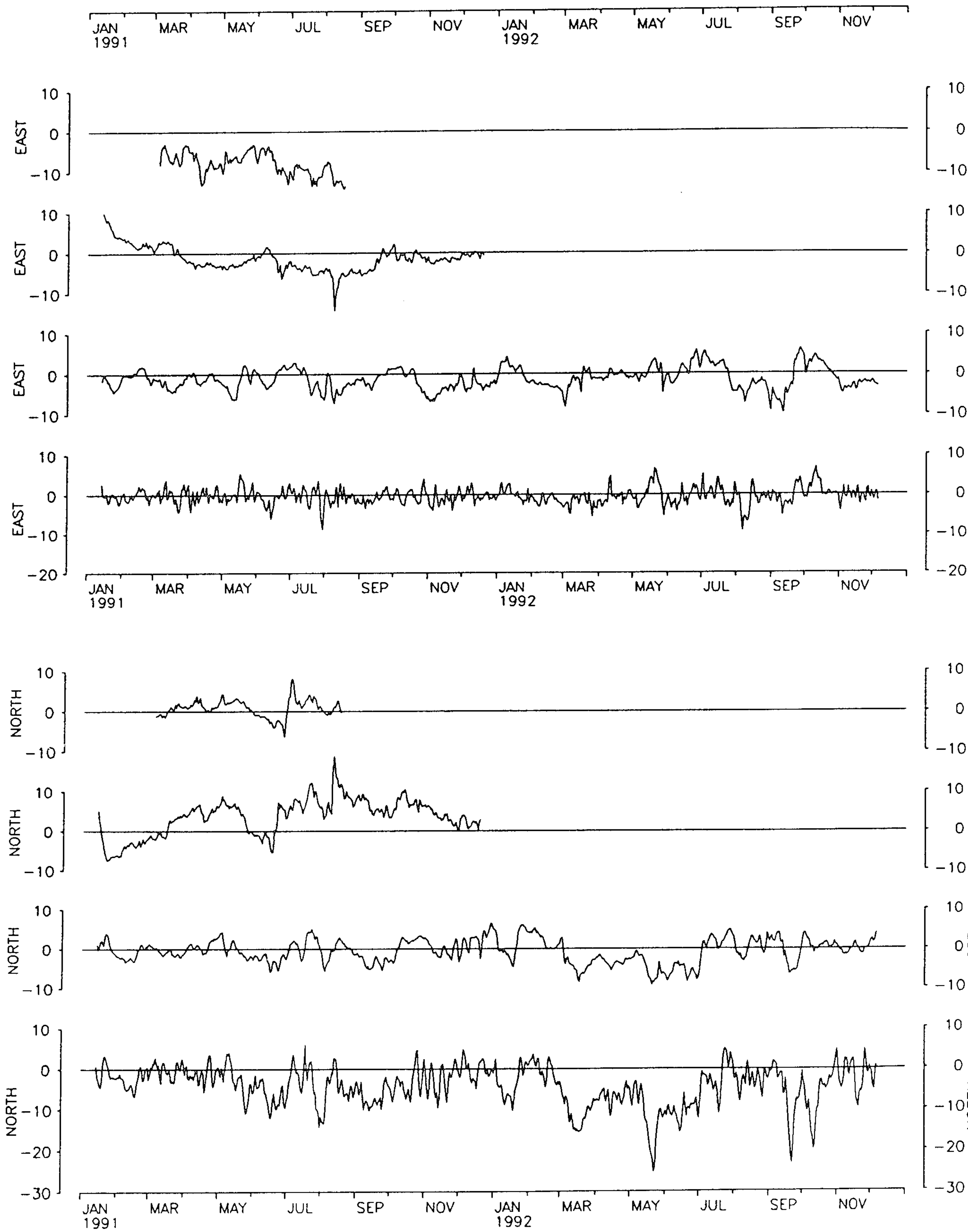


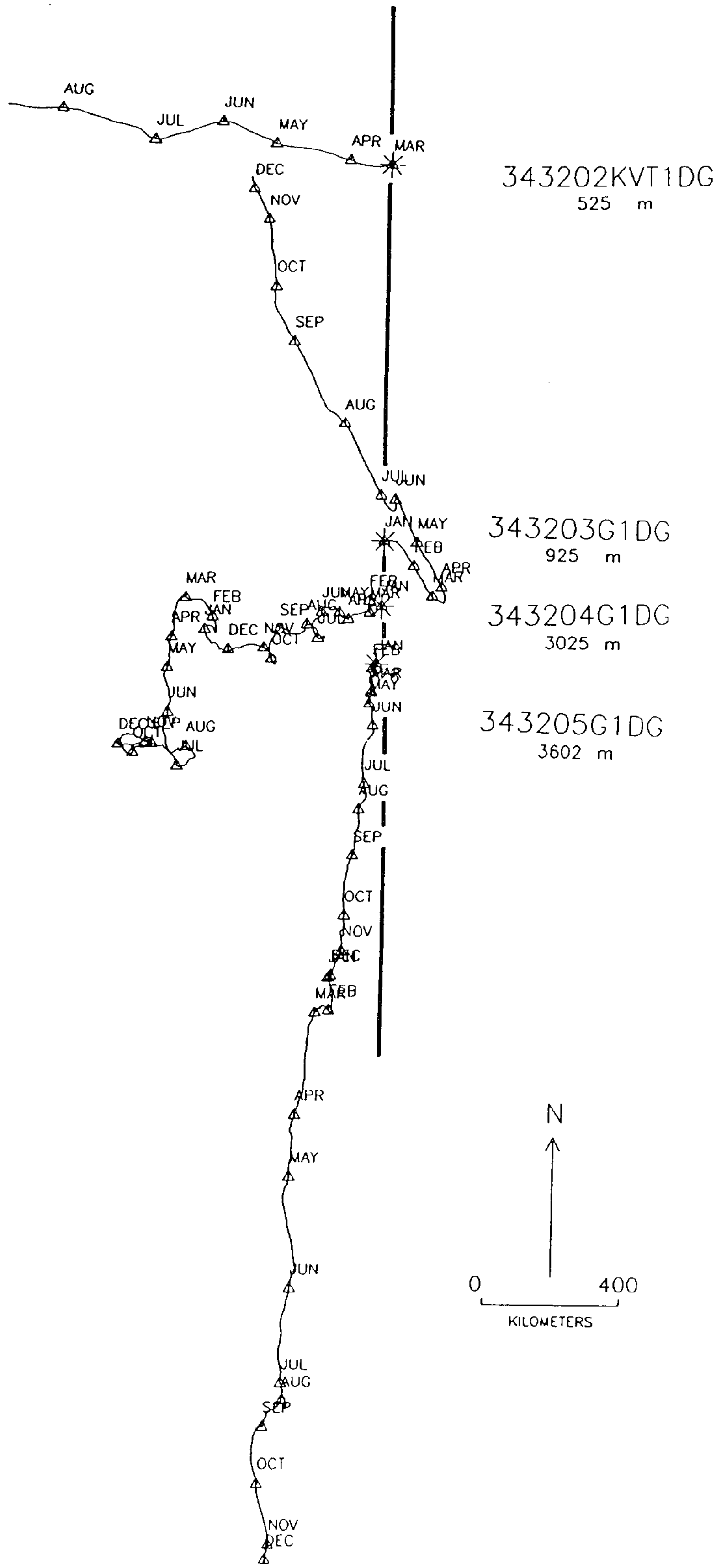
Mooring DBK/343

* Temperatures at 525, 925, 3025, 3602 meters



Mooring DBK/343 * U and V components
depths of 525, 925, 3025, 3602 m.




343202KVT1DG
525 m
343203G1DG
925 m
343204G1DG
3025 m
343205G1DG
3602 m
N
0
400
KILOMETERS

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REPORT DOCUMENTATION PAGE	1. REPORT NO. WHOI-94-07	2.	3. Recipient's Accession No.

4. Title and Subtitle A moored array along the southern boundary of the Brazil Basin for the Deep Basin Experiment—Report on a joint experiment 1991-1992.	5. Report Date February 1994 6.
7. Author(s) Susan Tarbell, Ralf Meyer, Nelson Hogg, and Walter Zenk	8. Performing Organization Rept. No. WHOI-94-07
9. Performing Organization Name and Address Woods Hole Oceanographic Institution Woods Hole, Massachusetts 02543	10. Project/Task/Work Unit No. 11. Contract(C) or Grant(G) No. (C) OCE 9004396 (G)
12. Sponsoring Organization Name and Address National Science Foundation	13. Type of Report & Period Covered Technical Report 14.

15. Supplementary Notes

This report should be cited as: Woods Hole Oceanog. Inst. Tech. Rept., WHOI-94-07.

16. Abstract (Limit: 200 words)

The Deep Basin Experiment (DBE) is an international effort and a part of the World Ocean Circulation Experiment with the principal objective of improving our knowledge of the subthermocline circulation. The DBE fieldwork is focussed on the Brazil Basin and this report is concerned with a moored array situated along its southern boundary which was installed in early 1991 to measure the inflow and outflow to the Basin and to investigate the Brazil Current near 30S. This moored array was a joint undertaking by the Institut für Meereskunde of the University of Kiel and the Woods Hole Oceanographic Institution. Moorings were deployed on Meteor Cruise 15, leg 1 and retrieved on Meteor cruise 22, legs 3 and 4. A total of 57 conventional current meters and two Acoustic Doppler Current Profilers were set on 13 moorings with some concentration within the Brazil Current and the Vema Channel. CTDs were taken at each mooring site as well as in between. Some of the recovered instruments were reset in the Hunter Channel, a suspected additional connection between the Argentine Basin and the Brazil Basin. A later report will summarize this data after it is recovered in May 1994.

17. Document Analysis a. Descriptors

WOCE

Deep Basin Experiment

ocean currents

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Approved for public release; distribution unlimited.	UNCLASSIFIED	107
	20. Security Class (This Page)	22. Price

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